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THE IRRIGATION AGE

VOL. XXVIII

TITLE REGISTERED U.S. PATENT OFFICE

No 1

CHICAGO, NOVEMBER, 1912

Irrigation Laterals that can be Lined Without Trimming



Ten per cent of the cost of concrete-lining irrigation laterals (according to Government Reports) is consumed in trimming and shaping the ditch to receive the concrete.

This 10 per cent is saved by digging irrigation laterals with an Austin Ditch Machine, which carves a true trapezoidal channel from the natural soil.

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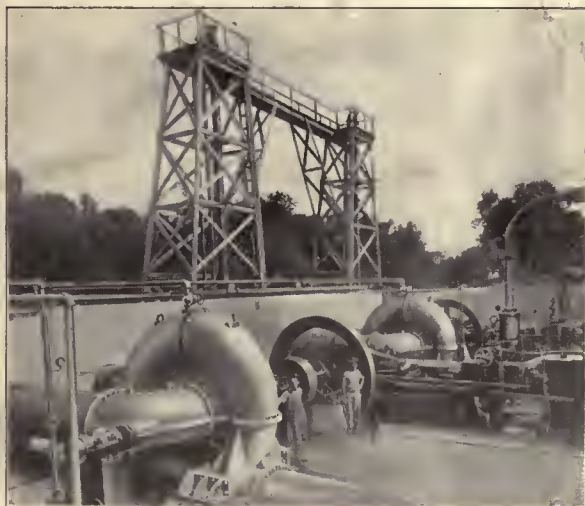
irrigation main canals up to 75 ft. bottom width or for enlarging old ditches; these machines all produce in one operation a complete canal with sloped sides and wide berms.

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Centrifugal Pumping Machinery, designed for any irrigating or dredging proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

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CHICAGO, ILLINOIS

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Working Heads, Pumping Jacks, Cylinders, Etc.

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The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches

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The Myers
Bulldozer
Power Pumps
For
Shallow Wells

Double Acting
Length of
Stroke
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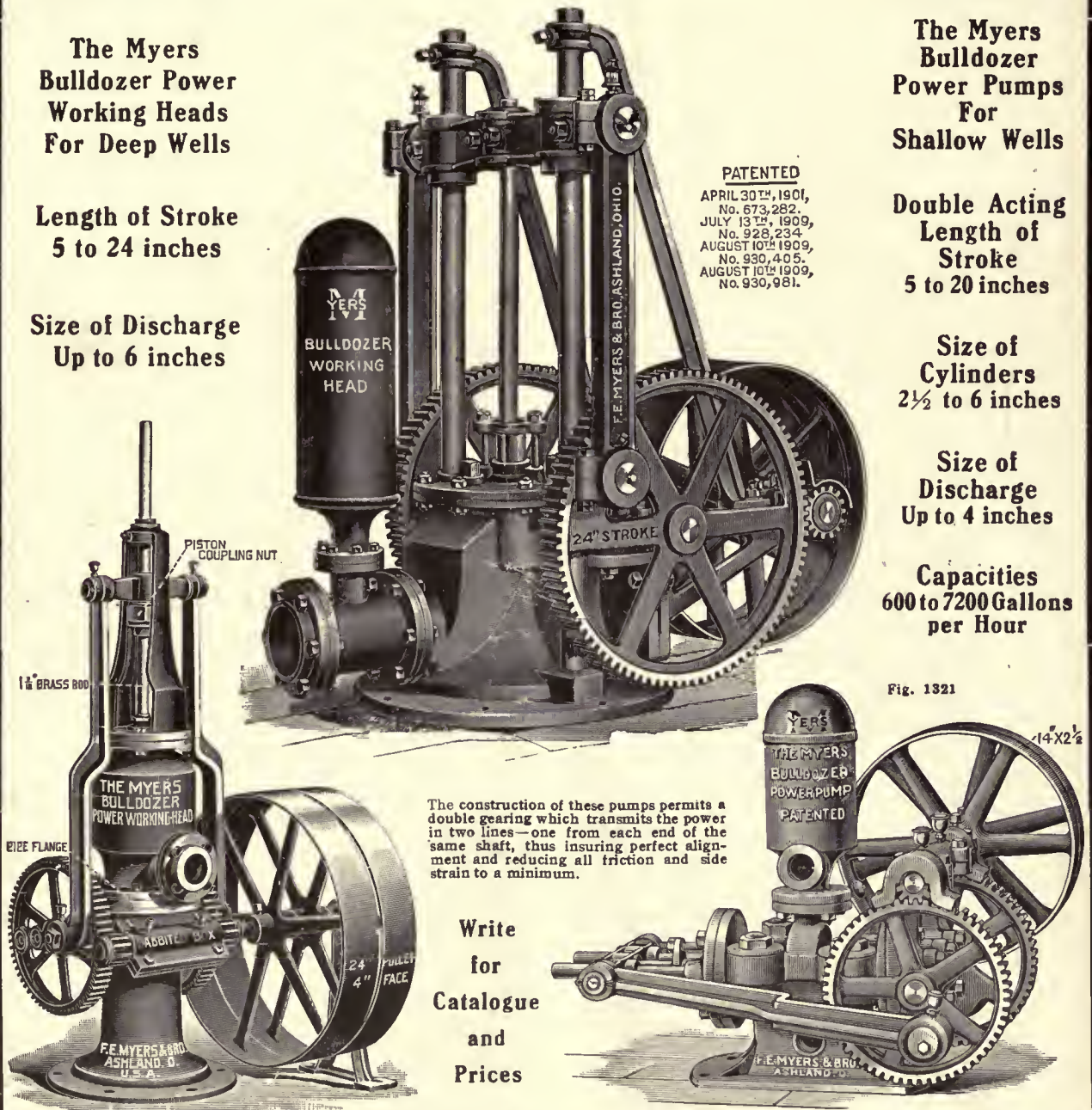
Size of
Cylinders
 $2\frac{1}{2}$ to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

PATENTED

APRIL 30TH, 1901,
No. 673,282.
JULY 13TH, 1909,
No. 928,234.
AUGUST 10TH, 1909,
No. 930,405.
AUGUST 10TH, 1909,
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The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

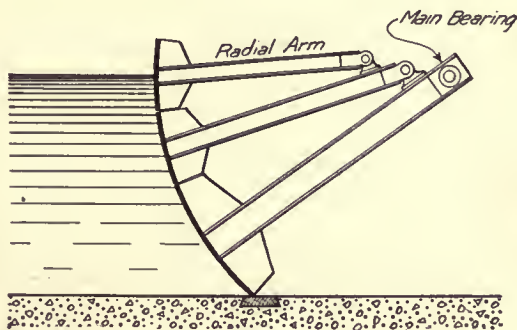
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Fig. 1321

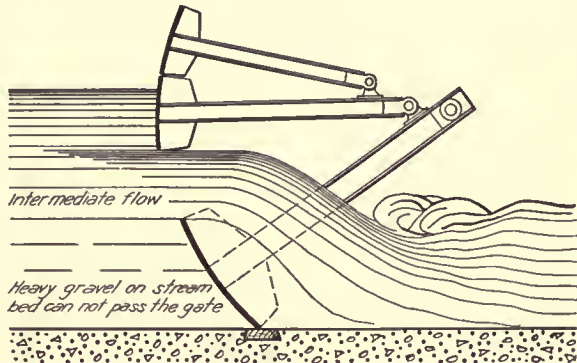
F. E. MYERS & BRO., ASHLAND, OHIO
ASHLAND PUMP AND HAY TOOL WORKS

THE HALL SEGMENTAL RADIAL GATE

For securing three-part control of water flow



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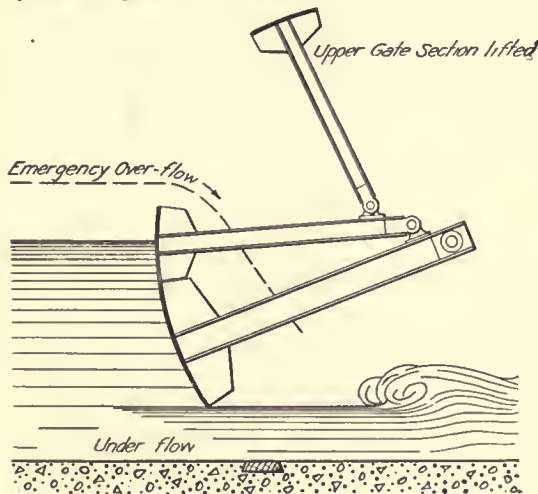


GATE RAISED FOR INTER-MEDIATE FLOW
(Head-gate example)

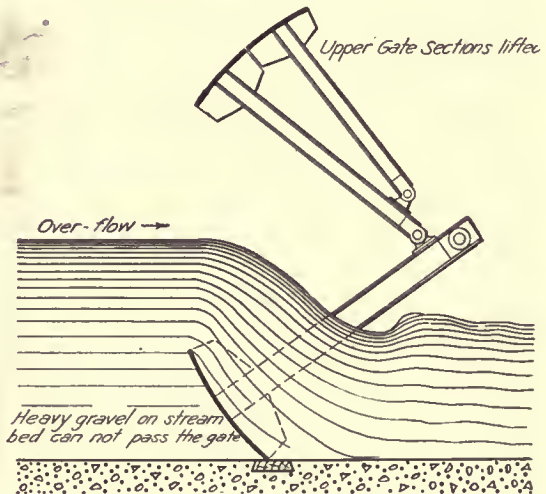
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Again, a diversion dam in connection with the canal head gates must always be able to reject the floating trash and sand at the intake and discharge them through the dam. Moreover, the pond above the diversion dam must neither be allowed to fill up, nor must the water level be lowered below the service point. Yet it must at the same time be controlled against sudden rises which would over-top the head gates.



GATE RAISED FOR UNDER-FLOW
(Waste-gate example)



GATE RAISED FOR OVER-FLOW
(Head-gate example)

This is a complex proposition and varies with every stage of flood. By the Hall Gate it is absolutely under control, no matter what the combination. The gates themselves scarcely cost more than the ordinary "Tainter" or "Drum" gate and are operated far more easily.

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5 Round Down Draft Kilns

Total Capacity 450,000 Brick

75 Acres of good material goes with
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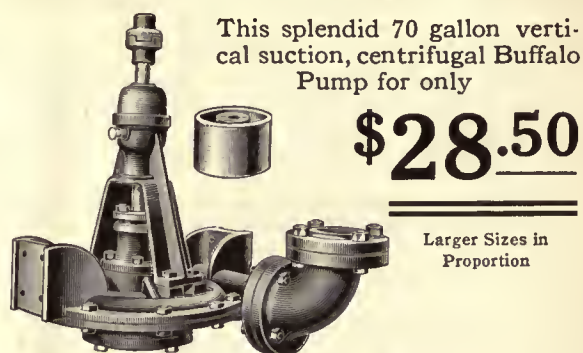
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Irrigation for Farm and Garden, Stewart.....	1.00
Irrigating the Farm, Wilcox.....	2.00
Practical Irrigation, Aug. J. Bowie.....	3.00
Practical Design of Irrigation Works, W. G. Bligh	6.00
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Cement Pipe & Tile, Hanson.....	1.00
Arid Agriculture, B. C. Buffum.....	1.50

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This splendid 70 gallon verti-
cal suction, centrifugal Buffalo
Pump for only

\$28.50

Larger Sizes in
Proportion

"Buffalo" Vertical Suction
Centrifugal Pump—the highest
pump value ever offered at the price

We are prepared to make stock ship-
ments from factory of this highly
recommended and exceedingly popular
irrigation pump, used for heads not
exceeding over 50 feet. It belongs to
the trade-marked "Buffalo" Class M
family, which has won just recognition
as the highest value obtainable in
popular priced centrifugal pumps.
The outfit includes pump, pulley, com-
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suction and discharge, as shown. Only
the finest white babbitt metal is used
in the extra long bearings, which are
furnished with brass compression
grease cups. Thrust bearing is of ball
bearing type. It may be installed by
attaching the suction flange directly
to the well casing, the pump itself be-
ing set between two vertical timbers,
which also carry the shafting, bearings,
etc., and is driven by pulley located
above the ground at top of the well.
Bearings, shaft collars, and steel shaft-
ing can be supplied at a slight extra
cost to suit your individual require-
ments. Being accurately made and
fitted, all parts of the pump are inter-
changeable and can be promptly dupli-
cated at any time. Couplings are
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Larger sizes also made. The price
quoted is f. o. b. our factory.

Send us your order now.

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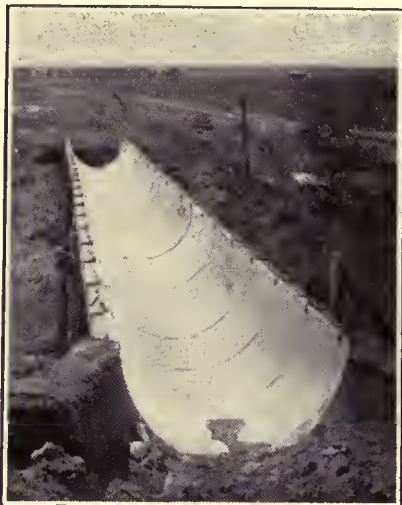
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Agents Wanted for our complete line of
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The Leavitt Metal Flume

First cost cheaper than wooden flume—will last three times as long. Open waterway. Nothing to catch trash and weeds.

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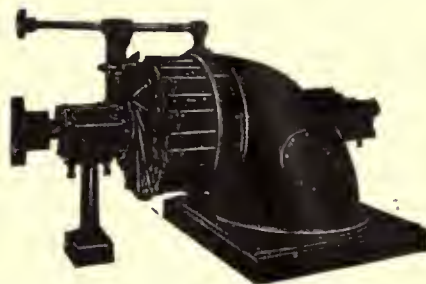
Our Flume Capacity Table will prove valuable to engineers and waters users. Shows hydraulic radius, velocity and capacity for all sizes and grades.

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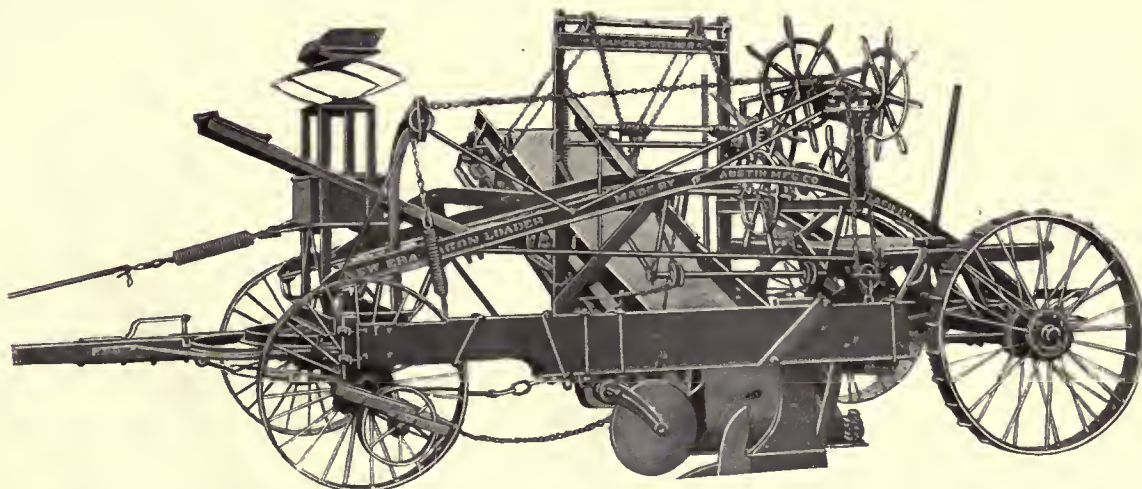
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who are all successfully building canals, ditches and railroads with the New Era Elevating Grader—Wickham Bros, Council Bluffs, Ia.; Bartlett & Kling, Scottsbluff, Neb.; Winston Bros. & Co., Minneapolis, Minn.; Alex. Mead, Greeley, Colo.; H. H. Whittier, Northfield, Minn.; P. E. Shugart, Nevada, Ia.; Russell Condon, South Omaha, Neb.



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4 Feet Wide — 26 Inches Deep
Cost 2c per Rod, Dig One Mile Daily
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20th Century Grader

One Man and a Team of Horses

Solves irrigation problems — enables you to get the full wealth of your land—cuts work in half—makes bigger profits. Weighs only 600 lbs. yet does all work of much heavier, more expensive grader in $\frac{1}{2}$ the time and does it better. Built of reinforced steel, close to the ground where it gets all the dirt. Unexcelled for making irrigation and drainage ditches, leveling land, grading and making roads and a score of other farm uses. Easy terms to responsible parties.



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giving full particulars and prices, and much interesting information that you should read. Write for it now.

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THE NAME TELLS A TRUE STORY

No matter where you live or what your seed-ing conditions are, you can get a SUPERIOR GRAIN DRILL that will fill the bill and do your work in the best possible manner. Superior Drills are made in all sizes and every style. Every Superior Drill is sold under a warranty that absolutely protects the buyer. Send for catalogue. Read it and go to your local dealer and insist on seeing the Superior Drill.

AMERICAN SEEDING MACHINE CO., (Inc.)
 Springfield, Ohio

GRAIN DRILLS

This Cot
Weights
Only
30 Pounds

Can Be Set
Up or
Folded in 30
Seconds

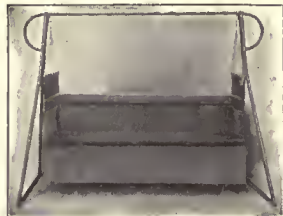


All Openings
Fitted With
Heavy Canvas
Storm
Curtains and
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FOR OUT-DOOR SLEEPING

Designed for Campers, Fishers, Hunters, Miners, Prospectors, Ranchmen and Invalids

There is no more popular or useful article of porch or lawn furniture made than the ENTERPRISE COUCH HAMMOCK. It can be used as a couch, settee, hammock or an out-door bed and is so thoroughly well constructed that it is almost indestructible.



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The "Kumpak" Cot

Ideal because of its simplicity. Extends into a bed 27 x 73 in. Folds into a package 3x7x38 in.

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Because of the regular and unvarying wear irrigation farmers give rubber footwear no one can judge more fairly than you of the results of our aim to build more service into "Ball-Band" Rubber Footwear than you can buy in any other rubber boot.

Try on a "Ball-Band" boot. Observe how it fits—snug and comfortable. Look the boot over; good workmanship stands out all over it. Every single boot must bear a keen-eyed inspection before it leaves our factory.

"BALL BAND"

TRADE MARK (Red) BALL BAND

If you like the looks of our boot, buy it and start in to wear it out. The test you give it will be as severe as a boot ever gets, but the "Ball-Band" Boot will stand the test because it is built to stand it.

Look for the Red Ball on "Ball-Band" Boots. It means that they are made with a clear conscience by men who know the wearers' needs. 45,000 dealers sell "Ball-Band" Rubber Footwear and eight million men wear it. If your dealer cannot supply you, write us. We will send the name of a nearby dealer who can supply you.

Mishawaka Woolen Mfg. Co.
 Mishawaka, Ind.

"The House That Pays Millions for Quality"

When writing to advertisers please mention The Irrigation Age.

Twenty-Eighth Year

THE IRRIGATION AGE

VOL. XXVIII

CHICAGO, NOVEMBER, 1912.

No. 1

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION

THE IRRIGATION ERA

ARID AMERICA

THE DRAINAGE JOURNAL

MID-WEST

THE FARM HERALD

D. H. ANDERSON

PUBLISHER,

30 No. Dearborn Street, - - CHICAGO
Old No. 112 Dearborn St.

Entered as second-class matter October 3, 1897, at the
Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

The "Primer of Hydraulics" is now ready; Price \$2.50.
If ordered in connection with subscription \$2.00.

SUBSCRIPTION PRICE

To United States Subscribers, Postage Paid, . . . \$1.00
To Canada and Mexico, . . . 1.50
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In forwarding remittances please do not send checks on
local banks. Send either postoffice or express money order or
Chicago or New York draft.

Official organ Federation of Tree Growing Clubs of
America. D. H. Anderson, Secretary.

Official organ of the American Irrigation Federation.
Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 28 years old and is the pioneer publication of its class in the world.

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Irrigation Affairs Improving In West.

Letters received from western states during the past month indicate a marked improvement in irrigation development work. In a letter received recently from Colorado, we are informed that several projects that have laid in abeyance for the past year or more have renewed activity and there is a likelihood of fine development during the coming twelve months.

Twenty- Eight Years Old.

This, our November, 1912, edition, marks the twenty-eighth birthday of IRRIGATION AGE, and the beginning of Volume 28. We are glad to be able to state that the beginning of this twenty-eighth year shows great improvement over conditions existing one year ago. At that time there was still a feeling of insecurity owing to the supposed instability of irrigation bonds, and the reticent attitude of capitalists throughout the country who were approached for money to carry out unfinished projects.

As is known to thousands of our older readers, the IRRIGATION AGE was the pioneer publication of this class in the world, and has been published continuously in this interest for twenty-seven years. It

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has kept abreast of all conditions associated with irrigation, has aided in every way the development of clean projects, and has, when its editor saw fit, criticized without stint the short-comings of various officials connected with the government control of irrigation works.

This criticism has, to a greater or less degree, reacted at times, and we have felt that the paper has lost business as a result of open criticism. This, however, has not deterred us from speaking plainly what we knew to be true, and it is our aim to continue this policy in the future. There are many weak points connected with irrigation that must be corrected, and corrected soon, or the entire development along this line will, in time to come, feel its effects.

There are also many concerns doing business throughout the West under the name of irrigation, who are sending out misleading literature and whom it is our intention to bring to light as soon as data is secured concerning these projects.

This is unfortunately true in many localities where conditions seem favorable for clean development. The sharpers frequently secure small holdings adjacent to well-developed and well-organized projects and by sending out misleading literature secure money from gullible eastern and central states people, who are apparently willing to put up their money without first investigating the property. This condition exists in as well favored a section as the Payette Valley in Idaho. There is no section in the United States that can offer better inducements to the settler who is willing to go out and investigate for himself. In that valley there is at least one unscrupulous real estate concern which has misled the public and whose actions will be exposed later in the columns of the IRRIGATION AGE.

Judging from the increase in business in our advertising columns we estimate that business for the forthcoming year will be equal if not greater than that of any similar previous period in its history.

We trust all of our readers may understand that our efforts will continue along the line of publishing matter that will be of benefit to beginners in irrigation as well as those who have practiced it for longer periods.

Fine Business Outlook Among Manufacturers.

During a visit since election to manufacturers throughout the western and central states, a representative of the IRRIGATION AGE learns that business conditions are very favorable, and manufacturers are all

buoyant and have no apprehension of the treatment which will be accorded them by the new administration. Heretofore there has been a feeling, encouraged possibly by some of the larger institutions, that times would slump during a Democratic administration, but it is impossible to conceive of any condition that will bring about even a mild slump in business affairs at this time.

There has never been a time when crops throughout the country have equalled those of this year, and this is particularly true of states west of the Mississippi river and the irrigated areas of the country.

As stated in a previous issue, the railways will find it difficult to move the crops from the irrigated sections to the best markets and this may, in a way, hamper some of the farmers who are remote from the markets.

Judging from the statements of manufacturers and their buoyancy and hopefulness for the future, we predict a wonderful era of good times for all of those who are dealing either directly or indirectly with the farmer, as it is the farmer after all who, in a way, shapes the business destiny of the nation.

Good Work By Bankers Association.

Word reaches us of the good work being performed by a representative of the Colorado Bankers' Association in bringing back to their proper status the true value of irrigation bonds. Reports from other sections of the west state that similar action will be taken by the bankers' associations in states farther west and this will result, no doubt, in materially bettering conditions along the line of irrigation development.

As mentioned in another editorial in this issue, we have word of the re-establishment of work on several good projects in Colorado, all of which will benefit Colorado through the expenditure of large sums of money. It will also prove good for those who are investing in the bonds.

National Waterways Magazine Announced.

Announcement is made by the National Rivers and Harbor Congress that the organization will issue the first number of a monthly magazine to be known as National Waterways, which will be the first magazine of its kind published.

The magazine will have for its purpose the pointing of a way to cheaper transportation through a comprehensive development of our lakes, rivers,

harbors and canals. Terminal facilities, shipping problems, freight and express rates, good roads, drainage, irrigation and forestation will be among the subjects dealt with from time to time.

There is a good future for a publication of this character, provided it does not get into the hands of men who will exploit it for their personal benefit. So long as a publication of this kind is backed by a strong organization such as that supporting the National Geographic Magazine, there is no doubt as to its upbuilding and the benefits that may be derived by the country at large from its efforts.

The promoters should, however, be particularly cautious about holding the control in the association so that individuals may not discredit the association and its work by making the magazine subservient to personal ambition and selfish aims.

**More
About
Maxwell
and Booth.**

In a recent copy of the Los Angeles Express we notice an article concerning the visit there of George H. Maxwell, formerly of the National Irrigation Association. The article states that "Mr. Maxwell, to whose name should be added the title executive director of the National Reclamation Association, the National Irrigation Association, the Flood Commission of Pittsburgh, the Louisiana Reclamation Club and River Regulation Commission of Stockton," has recently been a guest at one of the local hotels. He was there to report to the chamber of commerce of that city and county officials whom he represented at the late International Irrigation Congress at Salt Lake City.

It will be remembered by some of our readers that Los Angeles is the home of one C. B. Booth, who was, at one time, associated with Mr. Maxwell in conducting the National Irrigation Association, and who retired as chairman of the executive committee of the National Irrigation Congress shortly after the congress held at Portland, Oregon.

It was at this congress that a resolution was passed that was not directly favorable to either Messrs. Booth or Maxwell. One would judge from the tone of the Los Angeles article that Mr. Maxwell, as well as Mr. Booth, contemplates breaking into the irrigation movement again, and this may necessitate a reopening of the fight the IRRIGATION AGE has made in the past against the control of conditions associated with western development and the International Irrigation Congress attempted by Messrs. Maxwell and Booth prior to the Portland congress.

The article goes on to say further, that Messrs. Maxwell and Booth are negotiating plans for the so-

called National Irrigation Association in connection with the passage of the Newlands River Regulation Bill.

We are not familiar with the bill, but shall make an effort to study it and later enlighten our readers on the subject.

Judging from results of similar bills passed by congress it will be well to investigate this matter carefully before it is given the support of the people of the western states.

As we understand the bill now, it provides for an equitable division of the total appropriation of \$500,000,000 between the different river systems of the country. The people of the Mississippi river valley desire an amendment definitely setting apart \$100,000,000 of this amount for the lower Mississippi valley.

Mr. Maxwell has been telling the Los Angeles people that they should get into action and secure \$50,000,000 of this money for the Sacramento and San Joaquin valleys and \$50,000,000 for the Colorado river.

These are large figures and we will watch with interest the development of the bill when it is brought before congress.

**Girls
Study to
Improve
Farms.**

To make the country, and farm life particularly, more attractive to a million and a half inhabitants of the far-away South American state of Uruguay is the reason why four young native Uruguayan girls are enduring a two-years' voluntary exile in this country.

The four young ladies, Misses Martinez, Frigerio, Castellucci and Espinola, are at present in Ohio studying the public school system of that state.

A representative of a Cleveland paper quotes them as saying, "So far we have found no city that can give us exactly what we want, but we are picking up one point here and another there so that we will have something good to offer when we get back home."

It was in June, 1911, that the governmental exile of the four girls began and not until June, 1913, will it end.

The information given by the young ladies is that each year the Uruguayan government sends to Europe and the United States a group of young men or young women to study outside conditions for the improvement of that country.

Uruguay is essentially agricultural and everything depends upon the tilling of the soil. They have no large manufacturing industries and the idea

in sending the young men and women into foreign countries is to learn all that is possible about agriculture, so that it may be taught from the very earliest grades in their schools.

Another idea of the Uruguayan government that could well be copied by our own, is that this system of teaching agriculture will stem the tide of population toward the cities and have a tendency to induce some of the city folks back to the country.

It is the impression of Miss Martinez, who is evidently the leader of this group, that this idea can be properly carried out if the schools generally teach the subject of agriculture.

It is possible that some work of this kind has been carried on by the United States government. If not, this will be a good suggestion to our Department of Agriculture.

Phoenix Decides Not to Entertain Irrigation Congress.

Our news bureau items inform us that there is a strong likelihood that the International Irrigation Congress will go begging for a site for the meeting of 1913.

At a recent meeting of the citizens of Phoenix, Ariz., whose representatives at Salt Lake City pledged a certain amount for the expense of the congress, a vote was taken and it was decided not to attempt to entertain the 1913 congress in view of the fact, as one of the gentlemen stated, that "Phoenix had better not try to entertain the congress unless she can do it well." The sense of the meeting was that it would not do for Phoenix to risk losing the excellent reputation for hospitality that has been accorded that city even for the benefits that would come with a session of the International Irrigation Congress.

The principal objection was raised on account of a request for an increased guarantee and the large expense entailed, with a lack of proper hall and hotel facilities to take care of the crowd that would naturally visit that city during the time of the meeting.

This brings to mind the fact that Mr. B. A. Fowler, who has held various offices in connection with the congress, was one of those who directly objected to the arrangement. Mr. Fowler has been in contact with the congress and its work since the time of its meeting at Phoenix in 1896, and is also familiar with the methods of raising money and its expenditure in connection with the work of publicity and entertainment.

It is surprising, however, to find Mr. Fowler objecting to having the congress held in his own city on account of lack of funds, when he, as an official, has been free to use part of the funds raised

by many other cities and has never heretofore suggested similar opposition.

This brings to mind the fact that the IRRIGATION AGE stated to Mr. Fowler and other officials of the congress a year or more ago that there was no necessity for the heavy initial expenses. It was claimed that the dignity of the congress could be better maintained by the regular employment of a high-priced secretary. The AGE has always insisted that the work necessary to carry on the congress could be done in three months' time.

Formerly, the secretary received no salary and was expected to pay all of his own expenses. At present the secretary has one or two assistants who are, no doubt, fully competent and able to handle the details of the work, and he receives not only his expenses in traveling, but a salary of \$3,600 per year.

When the congress gets back to a point where the secretary's work can be performed in three months' time, with possibly one or two assistants, and where the expense for this character of work does not exceed \$2,500, including stationery, etc., it will be found much easier to locate towns that will be glad to entertain that body.

As the Phoenix people look at it now it will require at least \$20,000 to cover the actual expense of publicity and entertainment. On the other hand, cities like Spokane, Ogden, Sacramento and Boise expended all the way from \$25,000 to \$80,000. There was an object in making a great publicity campaign in connection with this work, as it largely benefited each city and the country surrounding it. And so long as the citizens were willing to pay the bills no objection was raised.

It was supposed that owing to the completion of the Roosevelt dam and the immense amount of good that has been done the Salt River valley by the exploitation of this project, Phoenix and the people of the surrounding country would be very glad to stand a reasonable expense in entertaining the congress. The facts perhaps are that all of the benefit to be derived from the location of this great dam has already been taken advantage of, and the people there do not feel that it is necessary to further exploit their district.

Land values went kiting when the location of the dam was first decided upon, and there is very little likelihood of an increase in land values in that territory for some years to come. Hence, people who have made the money out of the location and were shrewd enough to secure this great expenditure for their territory, have no doubt, in many instances, pulled out from under and the new comers are not prepared to nor do they understand the

situation sufficiently well to take up the matter of entertainment of a congress that may, perhaps, be of no direct benefit to the community at large or individual owners.

The objection, however, raised by Mr. Fowler and the repudiation of the agreement that the delegates from Arizona made with the governing board of the congress comes with poor grace from a man who has been associated with the work as has Mr. Fowler, and it is doubtful if a decision of the committee of twenty can be wisely sustained in view of the fact that a back-down in a case of this kind is likely to be injurious to the city of Phoenix.

IMPORTANT RULING BY SECRETARY OF THE INTERIOR.

The irrigated West as a whole reports a bumper crop and the condition of farmers is generally prosperous. Here and there, especially in sections east of the Rocky Mountains, there have occurred hail storms, none of which, however, has resulted in widespread losses. The individual cases of damage to crops were sufficiently necessary to warrant the giving of temporary relief from payments for water rights and the Secretary of the Interior has recently issued a Service Order as follows:

Water users on reclamation projects whose growing crops are damaged or destroyed by hail and who for this reason are unable to make payment of the building charges under the Reclamation Act, which would become delinquent at the time of the next installment thereof became due, may, in the discretion of the Secretary of the Interior, be allowed a postponement of such charges, but no such postponement shall be for more than one year or extend beyond the ten-year annual payment period, the time within which the water right charges are required to be paid. No application will be considered from any water user who is delinquent in the payment of any reclamation charges.

Application for postponement must be made through the project manager or project engineer, upon the form prepared for the purpose, stating that the water user is unable to pay the building charge, so become delinquent and shall give in detail (a) description of applicant's land, length of residence thereon, description of improvements and statement of their value; (b) serial number of the water right application, with the amounts paid on account, respectively, of the building and the operation and maintenance charges for the several years in which installments of such charges were due; (c) the irrigable acreage for which water is available for the current year; (d) the number of acres in cultivation and the crops to which cultivated; (e) statement as to the cause of destruction or damage of crops and date when loss occurred; (f) number of acres and the nature of the crops destroyed or damaged; (g) statement of the condition of the crops before destroyed or damaged, with estimated total yield if destruction or damage had not occurred; (h) actual yield, if any, and estimated loss in money.

The project engineer will forward such application with his report and recommendation through the supervising engineer to the director of the United States Reclamation Service.

The director of the Reclamation Service will make suitable recommendation thereon to the Secretary of the Interior.

GOVERNMENT DAIRY DIVISION OPENS BRANCH OFFICE IN SALT LAKE CITY.

In extension of the government's work for the development of the dairy industry in the far west, the Dairy Division of the Bureau of Animal Industry, United States Department of Agriculture, has opened a branch office at Salt Lake City, Utah, in the McIntyre building. Mr. A. K. Risser, who was at one time in charge of similar work in the Southern states, will be in charge, and will have the assistance of Mr. F. H. Bothell, expert in market milk inspection, and Mr. G. M. Lambert, expert in creamery management. In addition to these there are now two Dairy Division men working in Idaho in cooperation with the State University, two in North Dakota in cooperation with the State Dairy Commissioner, one in Colorado in cooperation with the Agricultural College, and one has been assigned to Utah to begin work there at once in cooperation with the Agricultural College. All of these men will be directed from the Salt Lake City office.

The Secretary of Agriculture desires to increase this work in the Western States as rapidly as funds will permit, provided proper cooperative agreement can be made. These men go right out among the dairy farmers and give them personal aid in improving their work, in building silos, in keeping records of the individual cows to see which are profitable and which are not, and in other ways.

In the Southern states, where dairying has been backward, the field men of the Department of Agriculture have helped many dairymen to increase their profits 200 or 300 per cent within one or two years, and at the same time increased the wholesomeness of their products. It is expected that even better results will be obtained in the West. Nine Southern states which were doing no educational work in dairying at all when the Dairy Division began work there some years ago are now paying a part or all of the cost of that work, and it is producing splendid results.

The far West should stop procuring dairy products from the East. In addition to producing its own supply it should begin to help supply the East. The rich western lands, now that irrigation is being supplied, produce cheap alfalfa and other feeds, and this will make dairying very profitable. Moreover, dairying is necessary in order to make alfalfa raising as profitable as it should be. The all-important thing is that as dairying is started in new regions it should be started right, and the Department of Agriculture is helping to start it right.

All the work will be done in cooperation with state institutions, and as soon as they are in a position to carry on the work without it, the Department's aid will be withdrawn.

MEETING OF THE AMERICAN RECLAMATION FEDERATION

Marshall O. Leighton of the United States Geological Survey Spoke on the Subject of "River Regulation and Flood Control."

The American Reclamation Federation held its first meeting this fall on Monday, October 28th, at the La Salle Hotel, Chicago, with President Perkins in the chair.

The principal speaker at this meeting was Marshall O. Leighton, of the United States Geological Survey, Washington, D. C., who addressed the members on the subject of "River Regulation and Flood Control."

After Mr. Leighton's address President Perkins invited the members to ask questions and an informal discussion followed. Many interesting points were brought out during this discussion and we feel sure that our readers will find the proceedings instructive.

Mr. Leighton spoke as follows:

Ideas in many cases in regard to river control are largely based on local points of view. It is only now and then that we encounter an opinion or a set of ideas that are broad enough to encompass the entire question. In fact, it is rather bewildering to go about the country and listen to the methods—the account of methods—regulating rivers and preventing floods.

We have a great many problems in connection with this whole subject. There is probably no question of immediate public importance so perplexing and which involves so many local conditions and local interests, all of which must be conserved. I will discuss the question from the standpoint of the Mississippi Valley, for that after all is the greatest problem. We have in the lower valley a great stretch of delta country periodically overflowed. Moreover, it is one of the most fertile pieces of land on earth. Now the people of that valley appreciate the importance of a few things. One of them is flood prevention. Another is swamp land drainage and third is navigation. Naturally, they want to see their ideas consummated as soon as possible and as a rule they look at the problem from only the one standpoint, that is of levees. They want the floods kept off of the delta and to keep their lands in an agricultural condition. Now, that is a very laudible ambition on their part. People in the Ohio valley, on the other hand, have in mind the navigation, flood prevention and water power, and in order to carry out their water power ideas they are generally agreed upon a plan of flood conservation, reservoir installations, whereby the power privileges in that valley, which they now have, may be made productive of a great amount of energy through the release of stored water in these reservoirs during the dry period. In the west part of the valley we have the great Missouri and in the upper part of that valley, and in fact, well down through its lower reaches, we have people who are interested in irrigation and they, too, are looking for stored water or as much stored water as they can get. Now, suppose a man was running an industrial establishment, a manufacture, or anything of that kind, and he decided that his business required the development of one department to the

exclusion of every other, I think we will agree that that would not be a wise business development, and I do not think we would find any business man who would advocate such an idea. I think we may apply that directly to our river regulation and flood prevention propaganda, because the Mississippi river and its tributaries constitute today the biggest industrial plant on the face of the earth; there is no getting away from that at all, and there never will be an industrial combination that represents so many values, so many possibilities and such an enormous amount of invested capital and development prospects as does the Mississippi river system. Now, when you find people on the lower river or on the Ohio river advocating the development that immediately meets their needs they are placing themselves in exactly the same position as would the factory owner in developing one department to the exclusion of every other.

Our three most prominent political parties have declared that this river regulation problem is a national one and being a national one it cannot be developed in one part to the detriment of the other—that there must be harmony and unity and an undeviating thickness of all things. As it is a national question and so recognized it must be handled nationally. The people in the lower valley want levees and that is a very commendable want on their part, but I think that we should stop to consider that levees are designed to waste water—to get it to the ocean in the shortest possible space of time. Now, a flood above all things is a waste of water. The damage caused by floods is a bagatelle compared with the loss of value of the water—a loss of value in the water by reason of its running away to the sea quickly. With that water back upon the upper streams those streams will have a very much higher value. The people in the Ohio valley are considering water power very largely. They do not say much about it, but I find that when they talk about their flood prevention reservoirs they have the great water power idea in mind; and the same way with the people on the western side of the great Mississippi valley. Now, there is no one that I know of or no one that I have heard of that can outline a feasible system of river regulation and flood prevention for the Mississippi, and the reason is that they have not the facts necessary to touch an outline. I may believe one thing—I do firmly believe in one line of work, yet I am quite ready to confess, after a considerable amount of study, that I may be wrong. You know that before we can use the English language we must learn the alphabet; that in our attempt to regulate the Mississippi we are in a position entirely equivalent to that of a man who is trying to write without learning the alphabet first. It is amazing to find that in all this century that has passed, in all the time that our engineers have been at work on the rivers, but few fundamental facts necessary to an intelligent development of that river are at hand. We do not know anything about the

flow. It is true that here and there we have maintained flow measurement stations, but that information is in no wise conclusive. You cannot find out from an engineer today what are the run-off habits of any particular stream in the Mississippi basin, unless he comes down to the great big stream where the run-off habits are very easy to ascertain. There is an enormous engineering question in connection with the run-off habits of every stream and their relation to flood in the lower stream. We know nothing about it. We have just begun to scratch the surface.

Now, whether or not flood levees are the proper thing on the lower Mississippi, and flood levees alone, possibly is difficult to say. We have heard ideas but we cannot today demonstrate in a rational engineering fashion whether those levees are going to do—that are now projected—are going to be high enough or whether they are going to be too low. All through the middle of that valley the levees have been continually raised—a new standard has been set. The people in the lower valley have settled themselves down behind those levees with a feeling of comfort and security, only to find in a few years that the levees must be raised a bit higher. Last spring we had a terrible flood, the greatest in history of man, and yet it is perfectly apparent that another much higher flood may come and probably will come; so where are we going to stop. There is another thing with reference to levees that I want to call attention to. Take, for example, Cairo, Illinois. The flood height there was the greatest since the record began, and the reason why it was not higher was because the levee system broke. The same is true at Memphis and all down the river, and the safety of the cities on the lower Mississippi river in the last flood was due largely to the fact that their system of flood protection failed. Ask any man in Memphis who owns property whether he was glad or sorry when the St. Francis levee burst. If he is a candid fellow he will tell you he was very glad, especially if the water was very near his property.

Now, we have heard a great deal in recent years about reservoirs in the highlands. I believe in reservoirs. I have been unable to find a case where reservoirs have not been a benefit when properly constructed and when not attended by disaster, and it has fallen in my way to defend, as well as I could, the reservoir idea, and in some cases not altogether in a friendly way, and we find that when the levee man or the man who is opposed to reservoirs wants to play his final big card he talks about reservoirs failing and inundation and loss and death. Well, that is a fetching argument; there is something spectacular about it. We have poems and songs and all kinds of horrible examples before us, yet if we pursue the matter a little we will find that there has been, after all, only a few reservoir failures in the United States, and the fatalities compared with other sources of fatality are practically insignificant. More people have been killed in walking the streets of Chicago than have been killed by reservoir failures. Those figures are easy to demonstrate, and whenever we find a reservoir failure we find a poor case of engineering or a poor example of construction, criminal in fact if not in law, and when you go back to the Johnstown disaster and try to make a case against reservoirs you

are going back to a mud bank which never should have existed. Now, we have losses in steamships, fatalities on railroads, fatalities in connection with everything else, and yet we are still building railroads, and steamships are now being built that are larger than the *Titanic* was. The fatalities after all are part of the price that we must pay for the social and economic advantages. If we did not take that view of it we would all be crouching in the open country shaking with apprehension. Briefly, there are two methods that are now being agitated with reference to river regulation; neither one of them is a panacea. If water is held back in the hills by reservoirs less floods will come down to the lower valley, unless perchance the flood itself rises in the lower valley and that is extremely rare, and such floods are usually almost always without disastrous effect.

Hold back the water in the hills; I believe in that, and it is possible to render the lower Mississippi valley free from floods that arise in the Ohio and upper Mississippi rivers, for in those two basins there is sufficient storage capacity to make floods free from danger in those two streams, and, of course, when the Mississippi valley is not flooded by reason of floods in those two upper valleys then the lower valley must always benefit from those reservoirs. In the Missouri basin, in the Arkansas and in the Red we have no such favorable reservoir sites, therefore levees will always be necessary in the lower Mississippi. It is not possible to get away from that.

Now, if I have given you any information on the subject or expressed any ideas it has been this, if you look at the matter from the standpoint of the lower Mississippi, there is nothing to it but levees; if you look at it from the standpoint of the upper Mississippi or the Ohio, there is nothing to it but reservoirs, so I say that is the logical, the patriotic and the scientific way to take this matter. It is the way that you would take up the rejuvenation or the reorganization of your own business—go into all of it. It is a national matter and must be handled by the National Government; and therefore the first thing to be done is not to build reservoirs or to put up high levees, but to sit down in a broad-minded way and look at the whole thing in the face, and when that is done I think we will see there is a large amount of merit in both propositions. Reservoirs are worth while. Supposing they did not benefit the lower valley at all, they are worth while to this nation. Water that is wasted in floods is sufficiently valuable to more than pay the cost of reservoirs. There never was a reservoir built that I know of that did not pay for itself by its benefits. I am talking about real reservoirs and not makeshifts. The increase in water power alone is sufficient to pay for the reservoirs. The inevitable benefit to navigation by reason of the relief of those flood waters during dry seasons is sufficient to pay for the reservoirs, so I think that whether we consider the lower valley or not we may disregard all the levees and all that lower valley and the reservoir proposition stands on its own bottom and it is justified by its own inevitable benefit.

Now, we all admit that levees in the lower valley are the proper thing—the necessary thing. If we had the reservoirs in the high lands it is probable, it is certain, that the levees would not have to be so

high or so strong. It is certain, too, that in low water periods in the lower Mississippi it would be less difficult to keep the channel open. I wish that I might give you in an illustrative way a solution of this whole problem, but I frankly confess we do not know anything about it, and if any man tells you that he does, you have a perfect right to doubt his word, because it is such a question that no man can render a solution of until he has in hand the elements that must inevitably direct that solution.

I wish this American Federation—it is a very comprehensive thing—an American Reclamation Federation, because reclamation is not confined to swamp land drainage nor to the irrigation of arid lands; it is confined to everything that needs reclaiming. I would like to see this association start out on a campaign of reclamation all through. Among all the organizations in the United States I do not find one that is specifically devoted to that purpose and in going about I find a great need of it—the truth with reference to river regulation and the truth in reference to swamp land drainage; how much we need, an organization which will establish that truth, also in regard to irrigation. Going about in the cities I read this and that circular written and published under the auspices of the Chamber of Commerce, and they come to my desk at home setting forth peculiar advantages of this or that project. Naturally I find them, wherever I happen to know of the conditions, permeated with untruth. I am sorry to say that some of the railroads do not always stick to the fact in their circulars. None of those railroads are represented here, however. I will be very brief. The reason why we are at fours and sixes upon this whole matter of river regulation is that we do not know the truth, and there seems to be no particular agency in the United States, official or private, which is given over to the ascertainment of the facts; and so I would say in starting out on a flood regulation and a river regulation propaganda the first thing to do is to ascertain the facts; and I am very sorry to say that we have not done that yet. I thank you very much.

(Continued in December.)

IMPORTANT WORK OF RECLAMATION SERVICE.

Advices received November 12 from Arrowrock, Idaho, report the laying of concrete for the foundation of the great Arrowrock dam, which will store water for the reclamation of about 250,000 acres of land near the city of Boise.

Its construction was authorized January 6, 1911. For two years work has been pushed vigorously on preliminary operations—the establishment of a camp; the building of a railroad 21 miles long for the transportation of men and materials; the building of a power house and transmission line for furnishing power; the building of a tunnel through which the river would flow while the natural channel was being prepared to receive the big structure as well as during construction; and finally the excavation to expose bedrock for the foundation to rest upon. Bedrock was reached on October 17, and on November 12 the first bucketful of cement was put in place.

CRUELITIES IN THE POULTRY YARDS

M. K. Boyer.

It is surprising how many people, otherwise model citizens, are guilty of cruelty to both fowls and animals. It may not altogether be intentional on their part, but nevertheless they do things that call for censure.

One of the most common acts is to carry chickens by their legs, heads down. This cruelty has been practiced for years, and no one ever thought anything about it. They did not notice the rush of blood to the head of the fowls when carried that way. A neighbor just the other day was carrying a fat hen by the legs, and in a few minutes the bird was gasping and came pretty near to choking to death. An equally cruel method is to carry fowls by the wings—especially so when the fowls are heavy bodied. The proper way is to allow the fowl to rest on the arm, and the legs held firmly by the hand; or it can be held between the arm and body.

A dealer was one day noticed to yank killing stock out of a crate by catching by a leg or a wing, and otherwise roughly handling them. When remonstrated, he replied that it did not matter, as the birds would soon be killed.

With some people it is common to throw fowls over the fence into a yard. There is no telling in what manner they will reach the ground, and when this cruelty is performed while the attendant is in a fit of anger there is considerable force put into the throw.

A very pious old gentleman was vexed to the cussing point because his chickens happened to get out of the yard through a broken fence into his garden. In his anger he threw a stone and lamed one of the fowls. "There, it serves you right; I don't pity you a bit," was the only comment on the accident. How much better it would have been to have carefully driven those fowls back into the yard and at once repaired the fence.

Verily, the contrariness of the hen is "not in it" with the contrariness and stupidity of some of the attendants.

A common cruelty is to overcrowd the flocks, especially in close, badly ventilated houses. Allowing the supply of drinking water to run out, and placing the drinking vessels out in the sun, are cruelties practiced by shiftless, lazy people.

Many acts of cruelty can be named in the methods employed in breaking up broodiness in hens. For instance, dousing them in water, tying them by one leg to a stake, or throwing them into a yard of young cockerels to be knocked about right and left, are all practices that should be stopped. Broodiness is a provision of nature for rest, and certainly the industrious hen deserves it. But if it is wanted to have her change her ideas or condition, the only humane way is to place all such in a separate house where there are no nests nor male birds, and allow them to gradually have the fever pass off.

For some years back it was the custom to sell

little (newly hatched) chicks at the poultry shows, and also at large bird stores around Easter. These innocents were bought by fond parents for their little tots, and carried to their houses in pasteboard boxes. Without the proper brooder heat or the right kind of food, these little chicks would be slowly tormented to death, quite often, too, by rough handling from the "cute baby." But it is now not so. The Society for the Prevention of Cruelty to Animals has taken hold of the matter and will no longer allow this uncivilized cruelty.

Anything that will inflict needless pain, or make the fowls uncomfortable, should be punishable. It is surprising how many people, who otherwise are kindhearted and good, will not stop to think that their very acts are uncharitable and unchristianlike.

Fresh air, sunshine and exercise are the best poultry tonics. But fresh air does not mean drafts in the house, nor does sunshine call for exposure to hot suns during the summer. Our houses should be so constructed that fresh air can constantly be present to drive out bad odors and purify the atmosphere. The sunshine should be able to reach every corner to destroy any germs that might be lurking in dampness. The fowls should exercise by scratching, that they may cause a good circulation of blood. The above are the three best methods in the poultry doctor's art.

Hardy parents beget hardy offspring. If we neglect in this particular each succeeding generation will be more delicate. No fowls should be used in the breeding pen that have had a case of serious illness. No matter how sure we may feel that full health has been restored, there is still some taint of disease remaining in the fowl which will be inherited by the young. Inbreeding has caused more weakened constitutions than anything else we know of.

Some years back the poultry fraternity were greatly alarmed over the ravages of "cholera." If chickens died suddenly, or if they all of a sudden became sick, cholera was blamed for it. Of late years we hear very little about this disease, the reason for which is that we have very few if any cases of this dreaded disease in the poultry yard, and nine-tenths of those reported twenty or thirty years ago were not cholera, but instead a condition produced by a combination of indigestion and lice. The poultry were fed practically nothing but corn, producing an overfat condition, and the subject of grit was never thought of. Consequently the food being of a starchy nature, and not properly digested, and the hen or fowl being in an overfat condition, indigestion was sure to present itself. This trouble coupled with lice—and in those days the poultry keepers were not so particular about keeping lice at bay—the fowls would succumb to "cholera" just about as sure as the "good old summer time" came around. It is a fact that genuine cholera cases are almost as scarce as hen's teeth.

Egg eating is a habit that starts with hens, gen-

erally, that are out of condition. In other words, when the hen gets too fat, and also when there is a scarcity of lime in the bill of fare the shells of the eggs become thin. When being laid these soft shelled eggs usually break and the hen thus acquires a taste. It is always best to gather the eggs several times a day so that there will be no chance for breakage by hens crowding on the nest, or by the newly-laid egg striking those already laid.

For canker in fowls, the following remedy is recommended: Mix 12 drops carbolic acid, one teaspoonful laudanum, 10 cents' worth sugar of lead, 5 cents' worth sulphate of zinc, and one pint of water; shake well. Open up the nostrils with a broom straw, and with a small glass syringe inject into them the mixture, three times a day, and put eight to 10 drops in the mouth. Feed soft bran and give plenty of water.

Here is a novel way for preventing fence flying: Take good strong string, and tie a knot about three inches from the end; then take the end nearest the knot and put it around the tip of the wing, and tie a slip knot below the knot in the string, so it cannot pull too tight on the wing. Then pass the other end of the string under the other wing, and have it just loose enough so that the chicken can keep its wings folded naturally and tie same as other end. After it has been on about six weeks the string may be removed, and your chicken will stay in just as though it had never flown over a fence.

It is characteristic of the laying hen to be quick in her movements, and more or less of a nervous disposition. When a hen is lazy, and moves about in a careless, indifferent manner, she is pretty sure to be a poor layer.

An egg to belong to the strictly fresh egg class should not be over three days old, in summer weather, and a week old during winter. But in either case they must be kept in a cool temperature. Heat very quickly stales eggs. Crates of eggs allowed to remain in the hot sun for several hours will quickly change their condition.

Poorly dressed poultry goes begging in the market, while the supply of choice (fancy) stock is not sufficient to meet the demand. In shipping to market, all dressed poultry should be assorted according to size and color, in order to secure the best returns. Small, poor, scraggy birds half dressed bring prices in proportion.

A "large roaster" means a plump, soft chicken of four or five pounds weight. The broiler weight in March is one and one-quarter pounds each; in April, one and one-half pounds; in May, one and one-quarter pounds to two pounds. Old cock birds have a special classification, and do not come under the head of "large roasting" fowls.

"THE WESTERN SLOPE"

(Special Correspondence)

This, of course, refers to the Rocky Mountains and when the traveler boards the narrow gauge "Rio Grande" at Salida, Colo., visions appear to his mind's eye—the substance of things hoped for, the evidence of things not seen. But soon we begin to see, and the



Prosperity and Contentment—Colorado Farm Houses in the Uncompahgre Valley, Colo.

famed Marshall Pass receives us and bids us look to the four points, but especially onward, westward.

So we reach the Western Slope. Down, down we go into the "Gunnison Country," through the valley, following the great trout stream and on into the Black Cañon of the Gunnison, until we can go no farther, and herein lies the charm of this great fissure over the Royal Gorge. The imagination is left full scope and until the Reclamation Service intruded its irrigation project, this was a terra incognita.

So in man's mastery, we annihilate distance and time, changing the face and course of nature, removing mountains and touching with the rod of divination—man not only foretells but fulfills.

Thus is created the Gunnison Tunnel and thousands will perhaps thoughtlessly proceed to irrigate the fertile soil of the Uncompahgre Valley as a matter of course. But here we are on this Western Slope, and what of it? First, we must honor the great Denver & Rio Grande Railroad, without whose enterprise the Indian and the prospector would still be struggling for possession.

We are presenting in this issue some halftones of

views taken in that section of Colorado traversed by the Denver & Rio Grande Railroad. We are informed that Vice-President Brown, of the Denver & Rio Grande Railroad, has announced that the first steps in electrifying the Denver & Rio Grande system are to be taken at once. The first unit to be electrified will be from Helper, Utah, to Salt Lake City, 114 miles. The second unit will be over Tennessee Pass, the great continental divide in Colorado, and will involve the electrification of the line from Salida to Minturn, Colo., a distance of 87 miles.

The Utah work will be commenced early in 1913, and it is hoped that it will be completed by the time the new two per cent detour line over Soldier Summit is finished, in July of that year.

The Utah Utilities Company is to furnish the power of the Utah lines, and the Central Colorado Power Company will probably furnish the electricity for the Colorado lines.

The improvements to be undertaken by the Denver & Rio Grande, the Central Colorado Power, and the Utah Utilities Company will aggregate between twenty and twenty-five million dollars, most of which will be expended during 1913 and 1914.

Other units in addition to the two mentioned will be added from time to time, and eventually the entire system will be operated by electricity generated by the great power in the torrents now coursing down the mountain sides and which is only waiting to be harnessed.

This transition from steam to electric power is by far the most important improvement plan yet announced by the new management of the Denver & Rio Grande.

A contract has been awarded to the Utah Construction Company, of Ogden, Utah, contract in the sum of \$1,500,000 for the grading of the new double-track detour line over Soldier Summit, where the rail-



Potato Field, Surface Creek, Colo.

road crosses the Wasatch Range in Utah. This change involves the building of fifteen miles of new line and reduces the grade from four to two per cent. Construction will commence at once, and contract calls

for completion August 1, 1913. The work will be very heavy and will include one tunnel 255 feet long. There will be no bridges, but numerous concrete arches. The new line will be laid with 90-lb. steel rails, rolled at the plant of the Colorado Fuel & Iron Company, Pueblo, Colo. The track will be ballasted with Jordan Narrows gravel.

I. H. C. DEMONSTRATION FARMS IN THE NORTHWEST.

Two demonstration farms have been established in the Northwest by the I. H. C. Service Bureau, one near Aberdeen, S. Dak., and one near Grand Forks, N. Dak., and J. G. Haney, an expert agronomist, formerly connected with the Kansas Experiment Station at Fort Hays, Kan., has been placed in charge of these farms.

The I. H. C. farm near Aberdeen is located two and one-half miles from the city, and lies between two main travel roads. It is also on the double track of the C. M. & St. P., and embraces a half section or 320 acres. It is school land and has never been plowed. The land will be broken next spring and put into flax, a little corn, and an effort will be made to start alfalfa on sod. A variety of corn adapted to South Dakota will be selected with a view of producing seed corn, as well as small grains for general distribution. Modern buildings will be erected on this place—a grove and orchard will be started. Particular attention will be given to the proper cultivation, looking toward the conservation of moisture, which is one of the serious problems confronting the South Dakota farmer. The Commercial Club of Aberdeen, The Better Farming Association, and local papers evince a great deal of interest in the farm and have given the plan very hearty support. The use of farm tractors will be demonstrated on this farm. Accounts will be kept of all expenditures, including the cost of the labor in crop production.

At Grand Forks, N. Dak., a half section was leased. The land lies about a mile from the city limits, directly across from the University of North Dakota and on the Great Northern Railroad. The farm embraces 308 acres of tillable land. The improvements are only mediocre. This farm is practically all under cultivation. There are 60 acres in winter rye, and 45 in clover and timothy; a large acreage of corn will be planted next year, selecting the three principal varieties which are adapted to North Dakota—Northwest Dent, Minnesota 13 and Minnesota 23. Only seed that has matured in that locality will be planted, and it is hoped to obtain a large quantity of seed corn for general distribution. There will be a small field of alfalfa and some clover will be grown.

The weed problem which confronts the farmer of the Red River Valley can be successfully met if a system of crop rotation is followed. This rotation should include a cultivated crop such as corn. It has been the experience of many farmers that to grow corn and to follow same with wheat they have increased the yield ten bushels per acre the second year. Other crops will be grown, such as barley, oats and wheat. The slogan in the Red

River valley will be corn, alfalfa and clover. I. H. C. tractors will be used on this farm, as well as on the South Dakota farm, and both farms will be maintained on a self-sustaining basis. Careful accounts will be kept in both instances.

The soil is typical of the Red River valley. It is fairly well drained and has been farmed about the same as the average farm in that valley.

DRAINAGE.

The drainage of lands in the state of Colorado is of as great importance as the subject of irrigation itself. We apply water to the soil and call it irrigating; we spread it over the ground and see it sink from sight; we see crops grow and forget all about the excess water we apply. This water, however, is not lost and in later years will return to bless us or curse us, as the case may be, and it usually comes in the form of a curse rather than a blessing.

What is there that detracts more from the appearance of a prosperous farming community, as we drive along the country roads and look at the magnificent crops, than to see here and there large tracts of barren waste covered with white alkali so common in this state, producing absolutely nothing and all on account of a high water table? Perhaps this ground used to be as productive as any in the community but in later years farmers have found it impossible to raise anything upon it. They have finally abandoned it, and there it lies worthless to the farmer and worthless to the community at large.

Why this state of affairs? It is due, as stated before, to the high water table or, in other words, to the fact that the underground water has risen until it is within a few feet of the surface. Capillary action is then set up and excessive quantities of water work from the water table to the surface of the ground and there evaporate, leaving behind the elements that they carry in solution. These salts form the alkali which we see on the surface of the ground.

Can this land be reclaimed and can it ever be made first-class farming land? The answer to this question is "yes." It may be reclaimed in a number of ways, but the only permanent way is to thoroughly drain the tract. The laying out and installation of a drain is not the simplest problem in the world and is too often attempted by men who know nothing about it. My advice to the farmer is to hire some engineer who is capable of making the necessary survey and who knows how to lay out a drain system. Have him not only set the necessary grade stakes, but supervise the laying of the drain. Many drains have failed because of improper installation.

There are a number of different drain tile on the market, and to say that one is good and another is worthless would be not only unfair, but untrue. All of the burned clay tiles if properly made will last fairly well and make a suitable pipe for this kind of work. Wooden boxes also have a long life, but I believe it is a mistake to place in the trench open bottomed wooden boxes, unless the fall is ample to give a good velocity to the water. They clog

more readily than do the tile pipe and animals are continually digging into them, when water is not running, and filling them up to a greater or less degree with dirt.

Water is becoming extremely valuable in eastern Colorado and in many instances land may be drained, the outlet of the drain being so placed that the discharge enters some irrigation canal, and after filing upon the same the owner may sell it or rent it profitably. This has been done in a number of cases near Fort Collins. In some cases the flow has been sufficient to pay for the installation of the entire drainage system. Drain water makes good late water, as the flow usually continues well into the fall and when water in the ditches becomes low. The seepage water entering the drain is a maximum, hence the value.

The drainage of lands should be considered whenever irrigation is contemplated, because, if the sub-soil of the community does not of itself form a natural drain, it is only a question of time when the underground water will be so increased in volume that the water table will reach the surface in the many low spots. The worst alkali and seeped tracts that could be found in the country have been experimented upon and reclaimed in such a manner that luxuriant crops have been grown upon them, while surrounding them upon all sides was a barren alkali waste. A drainage system properly installed may be counted upon to do the work.—E. B. HOUSE, Colorado Experiment Station, Fort Collins, Colo.

NEW INCORPORATIONS.

California.

Yolo Water and Power Company: Principal office, Woodland.

Middletown Irrigated Farms Company, Middletown, N. Y.: Capital stock, \$75,000. Incorporators, C. A. Evans, H. D. Gould, A. C. Ogden, D. S. Horton, all of Middletown, N. Y.

Palmdale Water Company, Los Angeles: Capital stock, \$200,000. Incorporators, C. Cate, J. R. Avery, W. C. Fisher, K. E. Reardon and E. Lindsay, all of Los Angeles.

New Jersey.

Montana Water and Power Company, Trenton: Capital stock, \$3,500,000. Incorporators, H. F. Kroyer, New York City; G. H. Burt, Rosedale, N. J., and C. Norman Foy, Chicago, Ill.

Texas.

Cameron Farm Company, Orange: Capital stock, \$75,000. Incorporators, A. J. Bancroft, Geo. W. Bancroft and G. M. Sells, all of Orange, Texas.

Utah.

Utah Conservation Company, Salt Lake City: Capital stock, \$100,000. Incorporators, Lewis S. Hills, Salt Lake City; John Dern, W. W. Armstrong, C. H. Carlquist, O. C. Beebe.

Washington.

Irrigation Pump and Land Company, Seattle: Capital stock, \$1,000,000. Incorporators, J. Q. Dick, C. H. Brockhagen, John Arthur, W. R. Phillips and R. D. Ogden.

AN INTERNATIONAL IRRIGATION EXHIBIT AT THE SAN DIEGO EXPOSITION, 1915.

By JOHN A. FOX.

The following resolution, adopted by the International Congress at its recent session held in Salt Lake, should prove interesting to every section of the arid states of the West:

"Resolved, that the International Irrigation Congress cooperate to the fullest extent with the Panama-California Exposition in producing at San Diego, in 1915, the most elaborate and comprehensive International Irrigation Exhibit that has ever been assembled; that we invoke the aid of the legislatures of the several states forming the western part of the Union, and of the governments of all foreign countries interested in irrigation, to the end that this plan may be successfully carried out."

The Board of Governors met the day following the adjournment of the congress and elected one of their number, Mr. Douglas White, of California, to act for that body in carrying out the resolution.

There are now about 13,000,000 acres under irrigation projects in the several arid and semi-arid states; and there are 30,000,000 acres more capable of being irrigated. Millions of people in the United States do not know what the Reclamation Service is, nor what it has done towards extending and enriching the agricultural area of the United States. They have no idea of the practical working of irrigation, nor of the wonderful results that are obtained. There are hundreds of men in the East with money to invest who know nothing of the opportunities and possibilities for investment in developing irrigation projects; and those who do know are ignorant of the process by means of which their money is made to transform the desert into a garden. Many have invested blindly with no knowledge of the subject, and have lost large sums.

Nothing could be more appropriate, therefore, in the celebration of the Panama Canal opening in 1915 than to illustrate what irrigation has done, and what it can be made to do, in the development of this vast section of the United States to which the Panama Canal means so much. An Irrigation Exhibit will not only educate and enlighten thousands of people regarding the West and its development, but such an exhibit can be made one of the most unique and original features ever presented at a World's Exposition.

Here, through a practical illustration of an irrigation project, the Eastern capitalist can be made to understand why and when it is safe to invest in irrigation bonds; here the prospective farmer, whether from Europe or the densely populated East, can see his future environment in its true light. The Western states need both capital and labor to develop their wonderful resources, and the action of the National Irrigation Congress in passing such a resolution will, no doubt, prove both wise and timely.

It was Col. D. C. Collier, president of the Panama-California Exposition, who first conceived the idea of making an exposition the means of exploit-

ing irrigation, and ever since its inception this exposition has embodied irrigation as one of its principal themes.

It was here at San Diego that the first irrigation dam was built by white men on the North American Continent. That old dam is still standing, a monument to the sagacity and foresight of the padres who settled here in 1769. It was from there that the first call went out in 1890 for the formation of the Irrigation Congress, and the father of that great movement, Mr. W. E. Smythe, still lives here. So it was fitting and appropriate that this city be made the setting for a great irrigation exhibit in 1915.

The exhibit contemplated will tell a graphic story of how the desert was conquered in this country, in Asia, in Africa, in Australia and in South America. Through the Reclamation Service of the National Government it is possible that Uncle Sam will appropriate sufficient funds to show what he has done in building the great Roosevelt dam, the Elephant Butte dam, the Arrow Rock dam or the Gunnison tunnel; how the Reclamation Service has stored millions of gallons of water and built miles and miles of canals to distribute it over great arid regions. England may be induced to show what she has done in Egypt by building the now famous Asoit and Assoin dams on the Nile. Such an exhibit will lend to every Western state interested in irrigation a splendid opportunity for exploitation, and will undoubtedly attract the attention of the legislatures of a number of the states. The great financial institutions of the moneyed centers that are carrying millions of dollars' worth of irrigation bonds, and all of the great machinery supply houses will see in this plan an opportunity for advancing the cause of irrigation throughout the world that has never before been given, and will lend their aid and cooperation in carrying it out.

The great 1,400-acre park here, where the exposition is being held, consists of miniature mountains and valleys, level mesas and steep hillsides—in fact, a topography that will lend itself admirably to a practical illustration of how irrigation is carried on everywhere in the world. Irrigation in America can be shown in its every phase—the celery beds of Florida, the rice fields of Louisiana, the apple orchards of Idaho, the citrus groves of California, the onion fields of Texas. There can be systems of irrigation by gravity, by pumping, by deep wells; by open ditches and by closed pipe lines under pressure.

There is plenty of room on the site of the San Diego Exposition for making the most wonderful irrigation exhibit ever conceived, and the climate and environment of Southern California are especially propitious for such an exhibit. That the irrigated sections of all countries of the world will cooperate to make such an irrigation exhibit seems a foregone conclusion.

GOVERNMENT SALE OF TOWN LOTS.

The Reclamation Service will hold an auction sale of town lots in the government townsite of Powell, Wyo., on December 2, 1912, and will sell to the highest bidder about fourteen blocks of business, residence, and acre lots.

Powell, Wyo., is centrally located in the Shoshone irrigation project on the line of the C., B. & Q. Railway. It is advantageously situated, and in the near future will be connected with the new line from Seattle to Galveston. Surrounding the town are 30,000 acres of fertile land now occupied and in cultivation by the new settlers on this project. Approximately 50,000 acres additional will be irrigated in the near future, insuring a permanent trade for the stores and professional people. Good openings will be found here for many lines of business. Both the town and country are growing rapidly. A very large crop was handled this year, and the farmers are more prosperous than ever before.

Among the lots to be sold are a number of acre plots which are adapted to truck farming. The growing demand for these lots on all government townsites is evidence of the fact that a family can easily be supported from the crops grown on an acre or two of land if properly tilled.

These lots may be purchased on easy terms and long time, and the prices are very low. Particulars may be obtained by addressing the Project Engineer, Powell, Wyo.

REWARD FOR INFORMATION OF EXISTENCE OF THE PRESENCE OF DOURINE.

The United States Department of Agriculture having found Dourine to exist in certain counties in the eastern part of Montana, has, in cooperation with the State of Montana, offered a reward for authentic information leading to the discovery of a horse affected with that disease.

It was believed that the disease had been completely eradicated from that section of the United States, and this new outbreak is to be met with the same drastic and thorough treatment that was used in previous campaigns against the disease.

The inspector of the Bureau of Animal Industry in charge of such work is authorized to pay the sum of \$50 for authentic information leading to the discovery of an affected stallion and \$25 for information as to the whereabouts and ownership of a mare affected with the disease.

This disease was first recognized in the United States in 1886, though it has long been prevalent in Asia and Europe. Each outbreak has been vigorously suppressed by the state and national authorities, and it is with a view of preventing the dissemination of and of aiding in the extermination of this disease that the above mentioned rewards are offered for information that will direct the authorities to sources of new outbreaks, so that they may quarantine the animals, slaughter those that are affected, and treat those that have been exposed.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.

DRAIN TILE BULKHEADS.

Concrete Retaining Walls Protect Tile Outlets.

In developing the low lands for farm purposes—and such lands are now the most valuable—immense sums of money have been spent in tile drainage. Too frequently a valuable tile drain is ruined by leaving the mouth of the tile unprotected. In such case the end tiles wash out; cattle tramp in the ditch; small

walls of the forms stand vertical and incline the front walls towards the bank so that the concrete will decrease in thickness from twelve inches at the bottom to six inches at the top. At the proper height to meet the tile drain, set a first class drain tile (at least one size larger than the regular string) in the forms so that its front end will be flush with the outside of the wall after the concrete is placed. Bore four one-inch holes in the front form around the tile and place in them well greased wooden pegs. After the concrete has become hard, the pegs are removed and, by means of cement mortar, bolts are fastened in these holes supporting a grating for keeping out muskrats, skunks and rabbits.

Mix the concrete one part Portland cement to two and one-half parts sand to five parts crushed rock or one part cement to five parts bank-run gravel. If the trench should contain a little water, mix so much of the concrete dry as will be required to take up the water. Make the remainder mushy wet. For the front of the wall, work a wooden paddle or a straight spade back and forth between the concrete and the forms so as to force back the pebbles and to give a neat mortar finish. At intervals of one foot in height, lay old iron rods in the concrete at the junction of the head and wingwalls. Smooth off the top of the wall with a wooden float and finish with a steel trowel. Remove the forms after one week and fill in earth behind the

wall to its top. With bolts, attach an iron grating or a screen of woven wire fencing to keep small animals out of the tile.

For a bulkhead of the dimensions given

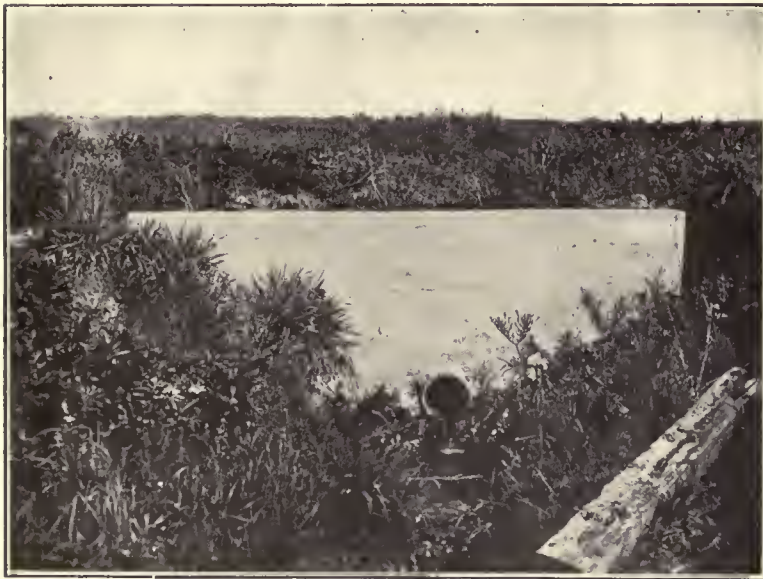


Fig. 1.—A Straight Retaining Wall With Grating Inside Tile.

animals build their nests up the tile; the outlet fills up, and crops drown out. Such a great loss can be prevented by a small outlay of time and money in building a concrete bulkhead or retaining wall to protect the tile outlet.

The straight retaining wall, shown in Figure 1, is a type which is often built where the open ditch begins at the end of the string of tile. However, most tile drains empty through the earthen side bank of the stream. Under these conditions, a better design is a retaining wall consisting of a head and wingwalls as shown in Figure 2.

For building retaining walls, choose a dry time of year when there is little or no water in the open branch. Consider, for instance, a tile emptying into a ditch six inches above stream bottom and three and one-half feet below the level of the ditch bank. Plan the bulkhead with a five-foot length of headwall and two wings three and one-half feet long. Slightly back in the bank, dig the foundation trench twelve inches wide and extend it two feet below the bottom of the open ditch. Turn the trench for the wingwalls at such an angle that the ends of the finished wingwalls will project back into the ditch bank and will be at ground level.

Old lumber will do for the forms. One-inch siding on two by four-inch uprights is good. Space the uprights about two and one-half feet apart. Let the back

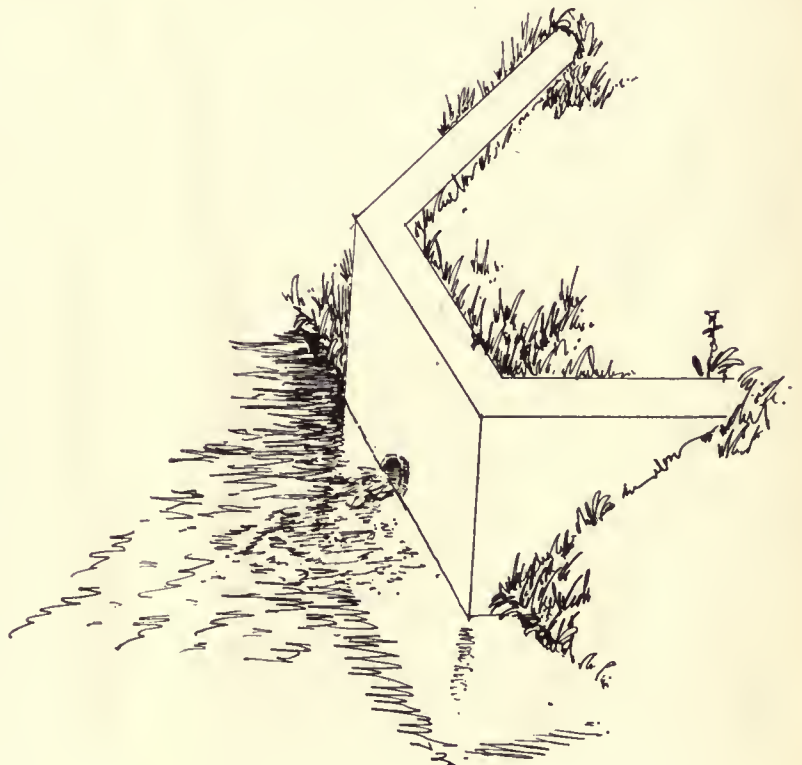


Fig. 2.—Wingwalls Prevent Bulkhead From Being Washed Out.

above, there will be required $2\frac{1}{4}$ cubic yards of crushed rock, $1\frac{1}{8}$ cubic yards of sand and 12 bags of cement. Ten dollars, the cost of the materials, may prevent the drowning out of several acres of growing crops and save the expense of digging up and relaying the tile drain.

THE AMERICAN FARMER TODAY REQUIRES A LARGE FUND OF KNOWLEDGE.

By J. E. Buck, of I. H. C. Service Bureau.

In the preparation of an article treating of the American farmer as he is today, the writer recently had occasion to say: "The farmer today is engaged in a business that requires more brain work than any other profession or vocation. The drudgery of irksome tasks has gone from the farm forever, and the wreath of laurel belongs to the inventors and manufacturers of the implements and machines which destroy the servility of endless drudgery and make bread cheaper."

The first sentence in this paragraph was severely criticised and declared to be absolutely untrue.

Inasmuch as the writer lived on a farm for some twenty years, and since leaving the farm has spent several years making a special study of the farmer and farm problems, he believed himself to be in position to write authoritatively on the subject of "The American Farmer Today," questioned the criticism and sought a verification of the statement criticised. Accordingly, a letter was addressed to ten of the highest agricultural authorities in the United States, asking them whether or not it would be an exaggeration or over-statement of the fact to say that the business of farming requires a larger fund of knowledge, wider reading and closer application than any of the higher professions.

In response to this letter the following replies were received, which we believe will be of special interest at this time, when so much remains to be learned about agriculture and the business of farming:

From John M. Stahl,
Editor Illinois Farmer.

After carefully considering the matter, I am sure that the sentence you submit is correct. I thought for a time that the lawyer might dispute with the farmer the statement made in that sentence, but see clearly that, while a few lawyers may need, as episodes, as wide and varied knowledge as the farmer, the average requirement of the farmer is much broader. I once—in my younger days—studied law. During my three years in a law office we studied, for example, a dozen leading works on surgery, and for the time being could trip almost any surgeon. During that time, also, we studied hydraulic dredges from the ground up. But these were exceptions—and the practice of law was not specialized in those days as it is now. In nearly all industries and professions the tendency has been to narrow the operations of the individual and therefore to narrow the required knowledge. In farming the tendency has been the opposite—to broaden the operations of the individual and far more to broaden the scope of required knowledge. I am sure your statement is correct and can easily be defended.

From A. F. Woods,
Dean and Director, University of Minnesota.

I have your note of the 12th inst., asking my opinion of your statement that the farmer today is engaged in a business that requires a broader scope of knowledge than any other vocation or profession. I think the statement is entirely safe.

From Cyril G. Hopkins,
Agronomist and Chemist, University of Illinois.

In my judgment, the sentence which you have framed is a good one. It is not putting the matter too strongly. The old statement that "any fool can farm" would be less erroneous if it stated that any fool can wear out rich land.

From Henry Wallace,
Editor Wallaces' Farmer.

I think your statement would be quite correct, if before the word "knowledge" you insert the word "practical." To be successful, the farmer must know his soil—and almost every farm, even in the prairie sections, contains several types of soil. He must know the elements of fertility which the soil contains, and also those in which it is more or less deficient, and the means of supplying

them. He must know in a general way the laws that govern the movement of water in the soil, and the management of the soil that will enable him to control as far as possible the water supply both from below and above. He must know the water storage capacity of his land, for upon this stored water he must draw during the summer season for the water needed to perfect his crop.

He must understand his plants, both the root system and the leaf system. He must know the life history of the insects which prey on his plants, in order to combat them successfully. He must have a practical knowledge of the laws of heredity which govern both in the plant and in the animal.

He must have a practical working knowledge of balanced rations, in order that he may know how to feed as well as breed, how to grow as well as finish for the market. He should have a practical knowledge of the diseases, parasitic and otherwise, that prey upon his live stock. He should have a working knowledge of markets, of supply and demand.

In addition to all this, he must have the knack of doing things, which can be acquired only by the doing of them. In short, he is obliged to be more nearly an all-around man than any other class of men of which I have knowledge. The reason why our lands do not yield more than half their capacity is because farmers as yet do not have this practical, working knowledge combined with the skill or art of putting it in practice.

I do not think your statement is too broad if you insert the word "practical" before the word "knowledge." It is the ideal rather than the practical farmer, however, that you are describing. I believe in putting ideals clearly before the minds of the people, for in everything we must have an ideal before we can realize the actual.

From P. G. Holden,
Formerly Superintendent Agricultural Extension Department, Iowa Agricultural College.

There is no doubt whatever as to the soundness of your statement. Not only this, but all the rest of the world is dependent on the intelligence displayed by the farmer in his business.

From C. F. Curtiss,
Dean and Director, Iowa State College.

I have your valued favor of the 12th instant. I think you are entirely safe in making the statement that successful farming at the present day and under the present conditions requires a larger fund of knowledge, and wider range of knowledge, deeper study, and closer application than any of the higher professions. In addition to the broad scientific, technical and practical information required, a good farmer needs to be a successful business man and understand the principles of economics, the laws of supply and demand, buying and selling, and all factors that affect market conditions.

From K. C. Livermore,
Professor of Farm Management, Cornell University.

In the absence of Director Bailey and of Professor Warren, to whom your letter of July 12 was received, I shall give my opinion upon the requirements for successful farming.

The old idea was that anybody could succeed as a farmer. This was simply an admission of the fact that so little was known about the business of farming that all were on the same footing. But today it is very safe to say that no vocation or profession involves so many problems as does farming, unless, to quote Professor Warren, "it be housekeeping." The successful farmer must combine executive ability, business ability, mechanical ingenuity and a great deal of skillfulness in farm practices. Besides this, he should be a naturalist. And if he is to understand his business he must be a scientist in the broadest sense.

There is no doubt but that the successful farmer of today is the equal of the successful lawyer, banker or manufacturer in ability, intelligence and resourcefulness.

From H. L. Russell,
Dean and Director, University of Wisconsin.

I think you are entirely right in the statement which you make. The agriculture of the future has got to be along scientific lines and the breadth of knowledge which is necessary to adequately handle matters which relate directly to agricultural practice is so wide that it practically involves not only fundamental, but all of the applied sciences, including social and economic sciences, as well as the material sciences.

Supreme Court Decisions

Irrigation Cases

DAMAGES FOR CONDEMNATION.

On condemnation of land for an irrigation ditch right of way, the owners were entitled to an award for the value of an existing ditch useful for the purposes designed by, and to be used by, petitioner, though the ditch had been constructed and abandoned before the owners acquired title to the land. *Roberts v. Scurvin Ditch Co.* Court of Appeals of Colorado. 125 Pacific 552.

DITCH ON HIGHWAY.

Where a decree of partition gave defendant's grantors right to maintain a ditch over the allotments of others, and defendant's grantors placed such ditch within the limits of a highway which the other allottees had dedicated to the public, the ditch was subject to the easement of the public. *City of Santa Ana v. Santa Ana Valley Irr. Co.* Supreme Court of California. 124 Pacific 847.

EFFECT OF PERMIT.

A permit issued by the state engineer to appropriate water from the public waters of the state is the consent given by the state that the applicant may proceed under the law and make an appropriation of the public waters. It is the initiation of the appropriation, but of itself is not an appropriation. *Marshall v. Niagara Springs Orchard Co.* Supreme Court of Idaho. 125 Pacific 208.

MEASUREMENT OF WATER.

Where the rights to water appropriated for irrigation purposes were in conflict, the amount to which the respective parties are entitled must be measured at the point of diversion from the stream, in the absence of evidence showing the amount of loss by seepage and evaporation. *Little Walla Walla Irr. Union v. Finis Irr. Co.* Supreme Court of Oregon. 125 Pacific 270.

DAMAGES FOR CONDEMNATION.

One whose lands were taken under the eminent domain act (Rev. St. 1908, §§ 2415-2464), to provide land upon which to construct an intake ditch to the reservoir of an irrigation district, was entitled to receive his entire compensation in money and could not be required to accept any part of it in the form of benefits to his land from a seepage ditch in no sense connected with and not a part of the intake ditch. *Von Richthofen v. Bijou Irr. District.* Supreme Court of Colorado. 125 Pacific 495.

TRESPASS IN CLEANING DITCH.

Where defendant, having an easement to maintain a water canal over plaintiff's land, sent workmen to clean out and repair the canal, a finding that they trespassed on ground not necessary for their work was insufficient to warrant a recovery against intervenor, since so trespassing the workmen acted beyond the scope of their employment, rendering themselves, and not intervenor, liable for their acts. *Hohn v. Davis.* Supreme Court of Utah. 125 Pacific 403.

RESERVATION IN IRRIGATION CONTRACT.

A reservation in a deed of an irrigation canal of a right of way to carry therein a specified amount of water subject to the payment of the grantor of the proportion of the expense of maintaining and repairing the canal that 350 inches of water sustains to the entire amount of water from time to time being carried through the canal required the grantee to maintain the canal, and see to it that all of the water transported through it is delivered to the persons entitled to in such quantities as each is entitled to receive, and any expense incident to such oversight of the canal and distribution of the water is a part of the expense of maintenance of the canal of which the grantor must pay its proportionate part. *Rogers v. Kest Riverside 350-inch Water Co.* District Court of Appeals, Second District, California. 124 Pacific 447.

INSPECTION OF PROPERTY.

Under Rev. St. 1895, art. 3126, which provides that any corporation organized for irrigation purposes may obtain sites and rights of way over private lands, the damages to be assessed and paid for as in railroad cases, and article 4424, which provides that no railroad shall enter upon private property except for a lineal survey, until it shall agree with and pay the owner all damages, the court, in condemnation proceedings by an irrigation company, has no right to permit an inspection of the land sought to be condemned for the purpose of qualifying its own witnesses as to the value of the property, or for any purpose. *Byrd Irr. Co. v. Smythe.* Court of Civil Appeals of Texas. 146 Southwestern 1064.

TRESPASS.

Where an appropriator of water for irrigation removed a portion of a dam constructed upon public land by a prior appropriator in such a manner as to divert the entire stream, and by such removal allowed a portion of the stream to continue in its natural course, his act was not a trespass and did not render his appropriation invalid; the rights of the owners of the dam being commensurate with their rights to the water, and they having no right to divert the entire stream to the injury of a subsequent appropriator, especially where they did not economically use all the water appropriated. *Doherty v. Pratt.* Supreme Court of Nevada. 124 Pacific 574.

UNDERGROUND FLOWAGE.

Where plaintiff sought to appropriate the overflow waters of a creek, evidence that there was a complete disappearance of such overflow at a point 1,500 feet distant from the lake, and that beyond that point there was no surface channel, nor any indication on the surface of an underground way or channel in the direction of a creek in which plaintiff had only inferior rights, such evidence established a prima facie case that the lake did not drain into the creek, and that the overflow was therefore subject to plaintiff's appropriation, which was not rebutted by mere evidence of the character of the debris filling the canyon and the configuration of the adjacent country. *Ryan v. Quinlan.* Supreme Court of Montana. 124 Pacific 512.

Injurious Results from Excess Use of Water in Irrigation.

In the following extract from a report by W. P. Snyder, Superintendent of the North Platte substation, Nebraska Experiment Station, the limits to beneficial application of water in irrigation and the injurious results arising from excess use are pointed out in a clear and convincing manner:

SOIL CAN CONTAIN ONLY A LIMITED AMOUNT OF WATER.

A sandy loam soil when very dry contains 6 per cent or more moisture. Ordinary crops deplete moisture in a sandy loam soil to only 9 or 10 per cent in the first 4 or 6 feet. The ordinary sandy loam soil, when saturated with water, contains about 16 per cent of moisture. A coarser soil contains less and a finer, heavier soil more than this amount. However, the heavy soil will withhold from the crop a much higher percentage of moisture than the lighter soil. Also the plants feed more deeply in the lighter soil, so that the amount of available water that may be stored in various soils does not vary greatly. One per cent of moisture in the first 6 feet of the soil is approximately equal to one inch of water.

Since the maximum amount of water a sandy loam will retain against gravity is about 16 per cent, and since the ordinary crop draws this down to only 9 or 10 per cent and since 1 per cent in 6 feet of soil means about one inch of water, it is obvious that there can be stored at any one irrigation only about 6 or 7 inches of water on a field growing a crop. This is allowing a maximum amount of water. Under most conditions one-half of this amount would be enough to saturate the feeding ground of the plants. If the soil is very dry, as alfalfa land or native grass land, then possibly 10 inches may be stored. If more water is added it goes deeper than 6 feet and is not readily available to the crop.

Why put on more water than the soil can use?

TOO MUCH WATER AN INJURY.

First: It washes out plant food. Nitrogen is the plant food element that the western soil is most deficient in. It is easily washed out. If washed below the feeding ground of plant roots, it is lost.

Second: Clogs the surface few inches of soil by cementing the small particles together and thus producing puddling, which all recognize as very injurious to soil.

Third: It crowds out air. This lessens the action of bacteria in making plant food.

Fourth: It lowers the temperature of the soil. This retards growth. The seasons are too short in the northern states, and growth should be hastened.

Fifth: The excess water that goes into the soil comes out somewhere. It often seeps out on the land lower down and injures it or even destroys its use for agricultural purposes.

Sixth: Water has a value the same as any other material. No man has a right to more than he uses properly. If he uses more than he needs or wastes it he is using something that does not belong to him.

STUDY OF THE SOILS.

"No industry is so vital to the well-being of a nation as agriculture, and nothing is so vital to agriculture as the soil. From its treasury it has been estimated that we drew during the year 1909 more than \$8,296,000,000, and its possibilities are as yet only partially realized. There are still in this country millions of acres which have never felt the plow, while those which are now under cultivation can, by the application of scientific principles, be made to produce many times the present value of their products. How to use and not abuse this great resource is the most important problem which faces the farmer of today—one worthy of the best efforts of our most profound and learned scientists; for upon its solution depends the future prosperity of the nation."

The above is a statement from Bulletin 85 of the Bureau of Soils relative to the soils of the country. While a comparatively small percentage of the soils of the United States have been surveyed and analyzed by the Department, more than 800 types of soils have been discovered during the progress of the soil survey. The existence of such a large variety of soil types, each possessed of definite and peculiar characteristics, calls attention to the importance of a careful study of the soils and their relation to agriculture. The Bulletin says:

"The old idea of soil investigation was to collect samples, examine them in the laboratory, and see what differences could there be determined; the newer idea is to study the characteristics and properties of soils in the field, classify them according to obvious differences, and, with this information in hand, use the laboratory as a means of ascertaining the cause of such variations as cannot be determined in the field. This method of attacking soil problems is the reverse of the usual practice, but because of the great difficulty in duplicating field conditions, it is believed that a field examination should precede laboratory studies. The field observations can thus be used as a check upon laboratory investigation and as an aid in their interpretation. Field studies furnish a safe and necessary anchor with which to keep the laboratory experimenter from being dashed against the rock of pure speculation. The classifying and mapping of the various soil types, together with the study of the conditions and processes under which they have been formed, will furnish essential and invaluable data for the conduct of laboratory investigations. Nature's great laboratory is in the field, and a study of her methods cannot fail to offer many valuable suggestions, and, in some cases, is the only means of solving her problems. It is through a combination of field and laboratory investigations that an understanding of this extremely complex body—the soil—can be reached."

The Bulletin treats exhaustively the soils, their origin, formation and best treatment for agricultural purposes, the great difference between the many types, and adds:

"Since the soil varies so much as regards both its inorganic and organic constituents, marked differences in treatment are required."
(Continued on page 26.)

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.

Reclamation Notes

CALIFORNIA.

A corporation known as the Yolo Water and Power Company, with offices at Woodland, will place 50,000 acres of land in Yolo and Lake counties under irrigation. White & Co., New York bankers, have bought out the Craig and Stephens interests, controlling the Yolo Water and Power Company, a corporation furnishing water for the irrigation of land near Woodland, and will carry to completion one of the largest irrigation systems in the west. The company purposes to ultimately reclaim 200,000 acres at an expenditure of \$11,000,000.

The Sharer Investment Company, J. R. McKinnie, J. E. O'Donnell and J. P. Kane, all of Los Angeles, have purchased the 2,400-acre ranch of J. H. Henry of Pasadena. The consideration is reported to have been \$125,000. The land lies near the town of Fallbrook in San Diego county. The owners will spend a large sum in the development and subdivision of the ranch, cutting it up into five, ten and twenty-five acre farms.

Ross & Stearns, of Los Angeles, have purchased 1,300 acres of land lying near Riverside in the Moreno valley, on which they will develop more water, piping it to the highest point of each tract. Citrus trees will be planted on most of the land.

Construction of the second unit of the irrigation system being installed on Planada Lands has been commenced. Mr. Lambert, an irrigation expert of Los Angeles, is in charge of the work. The section now being constructed will be built on the concrete distributing plan and is said to be one of the most effective and complete pieces of work ever considered in the San Joaquin valley.

The Middletown Irrigated Farms Company, of Middletown, N. Y., having as its object the irrigation of California lands, has filed articles of incorporation showing a capital stock of \$75,000. The incorporators of the company are Chas. A. Evans, Harry D. Gould, Albert C. Ogden and Dewitt S. Horton, all of Middletown, N. Y.

At a meeting held at Glendora recently by the stockholders of the Glendora Irrigating Company, Glendora Mutual Water Company, Citrus Belt Water Company and Independent Water Company, the matter of securing 1,000 inches of aqueduct water for this immediate district was voted upon, and by a unanimous vote they decided to take the amount of water if it could be secured at 2½ cents per hour-inch. The growers present subscribed for the entire 1,000 inches, practically mortgaging their realty holdings to secure the water.

Plans to extend the present system of wells and pumps used in the Oakland parks for irrigation purposes are being considered by the board of park directors.

The Carnine-Saunders Corporation of Fresno are completing plans for the opening of Bullard Lands Irrigated. The great tract of 7,200 acres has been under preparation for market for about a year. This is one of the most famous ranches in Fresno county

and the last great one near the city of Fresno. First water rights have been secured for Bullard Lands Irrigated. The Church Canal system will supply water in abundance. The canal company will also have the maintaining of the canals. This is included in the water rate which is only \$1 per acre per year.

Cooz Bros., of Los Angeles, have recently had a 627-foot irrigation well and pumping outfit installed on their ranch east of Cucamonga. The well up to date has cost \$5,000 and it is estimated that the pumping apparatus will cost in the neighborhood of \$600. The shaft in the well reaches down to 346 feet. The well will yield 100 inches of water per minute, and will be used to irrigate orange and lemon orchards.

Articles of incorporation have been filed by the Palmdale Water Company; principal place of business, Los Angeles; capital stock, \$200,000. Incorporators are C. Cate, J. R. Avery, W. C. Fisher, K. E. Bearden and E. Lindsay, all of Los Angeles.

The city of Riverside has under consideration the irrigation of 5,000 acres of land contiguous to the city. Much of the land is suitable for orange and lemon groves.

The Concrete Pipe Company of Porterville has been awarded the contract for the installation of a six-mile unit of 10-inch concrete pipe for the Lindsay-Rockford properties in the Lindsay foothills.

The Modesto irrigation district has appointed Attorney E. R. Jones and Engineer Crow to represent that district at the Hetch Hetchy hearing to be held at Washington, D. C., late this month. These representatives will voice the claim of the Modesto district to the water in the headwaters of the Tuolumne river as opposed to the claims of San Francisco that the Turlock and Modesto districts are using more water than is necessary.

The big citrus project that is being launched by the Sacramento Valley Irrigation Company is well under way and fifty acres have already been set to oranges. This one undertaking is to embrace 1,000 acres in citrus fruit and is located about eight miles east of the city of Orland. It has been stated that eventually the tract will consist of 3,000 acres. Wells have been driven in Stony Creek as a means of irrigating the grove. An underground system of concrete pipe will be used, some of the largest pipe being eighteen inches in diameter.

COLORADO.

The Secretary of the Interior has rejected the bids received on October 21 for the excavation of the extension of the West Canal and laterals of the Uncompahgre irrigation project. The work consists of 17.4 miles of canals and laterals involving about 50,000 cubic yards of excavation and 600 linear feet of tunnel. Schedule 2, involving 7,600 cubic yards of excavation and 600 linear feet of tunnel, will be re-advertised; the remainder will be constructed by government forces or under small contracts.

Contracts have been let to the Midwest Engineering Company of Denver for completion of the Terrace irrigation project in Rio Grande and Conejos counties. The Terrace and LaJara reservoirs are completed, and the contract calls for the construction of laterals and headgates in the distributing system. The project when completed will cost about \$500,000.

Work on an irrigation project which will reclaim 14,000 acres of desert land has been commenced by the Sam Farmer Escalante Irrigation Company of Denver. The lands which the company will reclaim lie south and west of Delta and Montrose counties. The \$200,000 necessary to install reservoirs and canals has been raised by W. L. Rucker of Denver, who has had charge of the financing of the company since its inception last May. The money was obtained by the sale of bonds in New York and other eastern points. Twenty-five miles of main line canal will be necessary to carry the water from the reservoirs which are to be built on the Escalante river and Cottonwood creek to the land which is to be watered. Three reservoirs in all will be built, the cost of which will be \$150,000. The Orman Construction Company of Pueblo has been awarded contract for construction of the project, and work will be rushed to completion.

Construction work on the Dolores irrigation project which will reclaim 350,000 acres of land in Montezuma county, will be begun within the next two months. W. M. Strong, a construction irrigation engineer, who is to be the resident-representative of Mr. Fred L. Lucas, of New York City, who has undertaken to finance the project, has arrived at Durango, which will be his headquarters until the project is completed.

Dr. John Gould, J. Albert Wright and Frank White, officers and organizers of the Riverside Land and Irrigation Company of Denver, who were convicted in September, 1911, of using the mails to defraud, have been sentenced to fifteen months in the

federal prison at Leavenworth, Kansas. The defendants were also ordered to pay the cost of the proceedings besides being fined \$100. One charge in brief is that they sold a duck pond as a big irrigation reservoir.

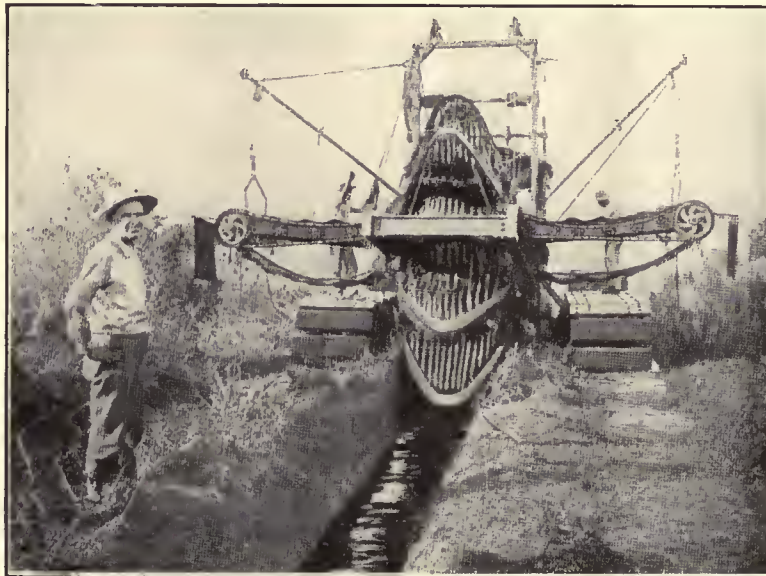
Fire caused by a "sulphur smudge" damaged the irrigation plant of the Foote Great Northern Company on Dry Fork near Meeker recently. Valuable maps and charts of the company were destroyed.

Secretary Fisher turned the first shovelful of dirt on the \$4,000,000 government Grande Valley irrigation project late in October. Excavation work has been started on tunnel No. 3 near Cameo in the canyon above Palisade. The project is planned to utilize the waters of the Grand River in reclaiming and making fertile 53,000 acres of land in the heart of Colorado's fruit belt. The land will be disposed of direct by the government in 40 and 80-acre homesteads which may be purchased with the water rights on periods ranging from five to ten years.

The affairs of the Orlando Reservoir and Irrigation Company, the lands of which lie in the southern part of Pueblo county and in northern Huerfano county, have been placed in the hands of a receiver. Recently the Scandia Irrigation district was created in that section and took in the reservoir site owned by the Orlando company. It is alleged by stockholders that incompetency on the part of the management of the company has caused its insolvency. Nothing can be done with the irrigating district until a title to the reservoir site can be secured. The project will irrigate 7,000 acres of land when completed.

The Pueblo Land and Irrigation Company of

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Pueblo has filed a map of the Pumpkin Hollow reservoir to be constructed northwest of that city with the county clerk. The reservoir will have a capacity of 107,750,150 cubic feet of water and a dam 65 feet high is to be constructed. The water supply will be derived from Pumpkin Hollow and Turkey Creek.

IDAHO.

A \$600,000 decision involving liens and mortgages on the Big Lost River irrigation project located in south central Idaho has been handed down by Judge Frank S. Dietrich of the federal court, in which he gives the Corey Bros. Construction Company of Salt Lake City the full amount of damages asked. The case was bitterly contested in the federal court for several years. Corey Bros. claimed \$600,000 due under contract from the irrigation company for the construction of the irrigation project. Their suit involved the trustees, bond houses and mortgage holders. The Big Lost River Irrigation Company became financially embarrassed but contested the claim of the contractors.

Work for the year has been suspended on the Keating irrigation project in Lemhi county which is being developed by Butte, Mont., capital. The irrigation system has been completed for 5,000 acres, and the state officers of Idaho desire the company to place the lands to be reclaimed on the market. The Keating project is unlike any other Carey Act land enterprise in that none of the lands included within the district have been offered for sale, it being the policy of the company to withhold the lands until water can be turned upon them. Chas. Beebe of Butte, Mont., is president of the Keating Company, and W. J. Irvine of Three Forks, Mont., is general manager.

A verdict was given in the federal court at Boise recently in favor of the Twin Falls Canal Company against the Twin Falls Land and Water Company for \$33,000 damages, alleged to have been suffered by the plaintiff through the defendant turning over the canal system to settlers. The case has attracted wide attention and the result will be important to other Carey Act projects. The case was brought upon claimed damages resulting from the construction of wooden headgates and weirs in the main, high and low line canals and on account of defective construction of the Point Spillway.

The Secretary of the Interior has authorized the Reclamation Service to accept the proposal of the Ogden Portland Cement Company of Ogden, Utah, for furnishing 130,000 barrels of cement for use on the Arrowrock dam, Boise irrigation project. The contract price is 99 cents per barrel, f. o. b. cars at Bakers, Utah. The engineers are also authorized to enter into negotiations for proposals for an additional 130,000 barrels.

C. B. Hurtt, of Boise, is authority for the statement that capital has been procured to complete the Big Lost River irrigation project which embraces an immense tract of land. Work on the project was stopped two years ago following the failure of the Trowbridge-Niver Company of Chicago, who were handling the bonds of the company.

The Secretary of the Interior has approved form of contract, subject to the acceptance by the board of directors of the Payette-Boise Water User's Associa-

tion, and subject to certain conditions, with the Hillcrest irrigation district, providing for the carrying of water to irrigate 3,000 acres of land through the main canal of the Boise irrigation project. For this service the sum of \$35,000 in ten annual installments of \$3,500 each, and also pay to the United States in advance \$600 per year as the proportionate share of the operation and maintenance charge of the project against the district on account of the use of that portion of the canal through which water will be carried for it. The maximum amount of water to be carried is fixed at 30 second-feet, and embraces certain water rights now appurtenant to lands which have become worthless for irrigation and of which the district is to secure possession and transfer the lands in question. In the event of their inability to secure possession and transfer of such right, the Secretary of the Interior is given power under the contract to cancel the agreement all moneys paid prior to such cancellation to be forfeited to the United States, and the government to be under no further obligation on account of the contract.

OREGON.

For the purpose of reclaiming over 20,000 acres of land near Klamath Falls, the Horsefly Irrigation Company has filed papers to organize the land into an irrigation district. The company plans to bond the district for \$775,000 and will erect a large reservoir and dam.

Land owners east of and adjacent to the town of Echo have formed an irrigation district which will embrace 50,000 acres of land, the greater part of which is already under cultivation, now being used for dry-land wheat growing. The district will be known as the Paradise Irrigation District. The directors of the district are as follows: A. B. Thompson, Frank Sloan, Joe Conley, W. M. Slusher and Jas. Hoskins.

Construction work has been begun on the Lamberon reservoir of the Bully Creek irrigation project which is to reclaim 40,000 acres of land surrounding the town of Vale. The contract for the construction of the project has been awarded to Maney Bros., of Boise, Idaho. This enterprise was promoted by Judge G. E. Davis and John Rigby of Vale, and involves an expenditure of \$1,500,000.

H. M. Teel, a senior in the civil engineering department of the Oregon Agricultural College, has been selected by the Hinkle Irrigation Company to take complete charge of the locating and laying out of their irrigating plant of something over 100 miles in length, the estimated cost of which is \$700,000. The tract to be reclaimed embraces 20,000 acres of land lying in the western part of Umatilla county. Water for irrigation purposes will be taken from Camas Creek.

The state of Oregon is now building, under the Carey Act, a dam and reservoir twenty-two miles north of Lakeview and an equal distance south of Paisley, Lake county, on the Chewaucan River, in the Fremont National Forest. The dam will be approximately 267 feet long on top and 35 feet at the bottom, 80 feet high from the bed of the river, 22 feet wide at the top and 390 feet wide at the bottom. It will be of rock construction, containing a solid concrete core wall five feet thick at the bottom and three feet thick at the top, the cement work being carried down

(Continued on page 27.)

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Conversion Table of United States and Metric Measures and Weights.

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Table of Logarithms.

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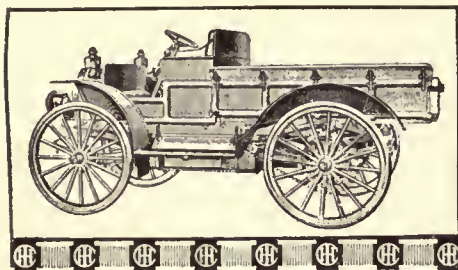


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(Continued from page 21,)

ferences in character must necessarily result from the almost indefinite number of combinations which may be found. All these differences, however, may be traced to two sets of factors: First, the character of the rock or material from which the soil has been derived; and, second, the processes or agencies by means of which this material has been changed from mere rock or rock debris into a medium suitable for the growth of plants. The former has to do with soil-forming material, the latter with soil-forming agencies. To these two groups of factors are to be attributed the numerous variations in soil conditions found over various parts of the earth.

"The importance of distinguishing between these two groups of factors cannot be too strongly emphasized. The tendency in the past has been to stress the former to the neglect of the latter, and this has resulted in classifying together soils of very dissimilar character, simply because they were derived from the same rocks or from rocks which have been formed in the same manner."

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Sworn to and subscribed before me this 11th day of October, 191...

RALPH G. INGERSOLL,

Notary Public.

(Seal.)

(My commission expires April 29, 1915.)

NEBRASKA IRRIGATION MEETING.

The Nebraska State Irrigation Association held a three-days' session at Bridgeport, October 22, 23 and 24. The following officers were elected for the ensuing year: President J. J. Beeler, North Platte; first vice-president, O. W. Gardner, Gering; second vice-president, Reuben Lisco; treasurer, S. W. Warrick, Alliance; secretary, J. E. Lablanche, Bridgeport.

By an amendment to the constitution offered by O. W. Gardner, Bridgeport was made the permanent meeting place of the association.

COAL DEPOSITS IN GUNNISON VALLEY.

A report on some coal fields in Colorado and New Mexico by E. G. Woodruff and W. T. Lee has just been issued by the United States Geological Survey as Bulletin 471-H. This report embodies a brief description of the coal resources of Gunnison valley between Grand Junction and Delta, in Mesa and Delta counties, Colorado, and of the Tijeras coal field in central New Mexico, about twenty miles east of Albuquerque.

A copy may be obtained free on application to the director of the Geological Survey, Washington, D. C.

Send \$1.00 for

The Irrigation Age

one year and

The Primer of Irrigation

(Continued from page 24.)

into bedrock far enough to cut off all leaks of water through seams or fissures. When completed the reservoir will have a water surface of 3,280. It will impound 42,800 acre-feet of the flood waters of the Chewaucan River to be used in irrigating 12,000 acres of government land adjoining the town of Paisley. The work, including the distributing canals, is to be completed within two years. This project is the first one contracted for by the Desert Land Board since the passage of the present stringent laws controlling Carey Act lands.

TEXAS.

John L. Wiggins, of Fort Worth, the inventor of the Wiggins system of sub-irrigation, will reclaim 5,000 acres of rich land in the Pecos valley. The tract is to be divided into small farms and sold to northern farmers.

The tower for the twenty-ninth irrigation plant in the Hereford district has been erected and drilling the well will begin at once. The well has been located four miles southeast of the town of Hereford. The well will be one of the McDonald type, which affords from 1,000 to 2,000 gallons per minute, and will irrigate from 160 to 320 acres. The horsepower of the engines used varies from forty to eighty, and the depth of the water from 27 to 75 feet.

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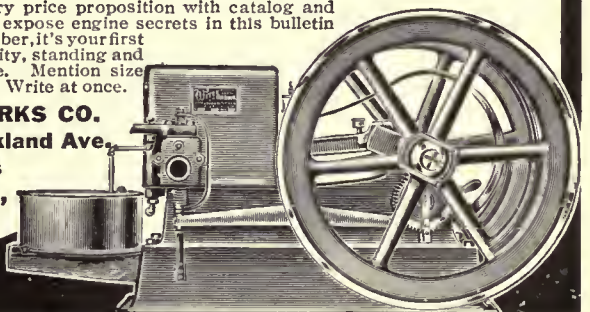
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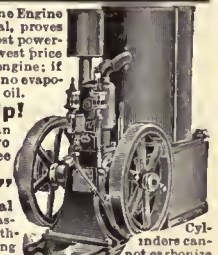
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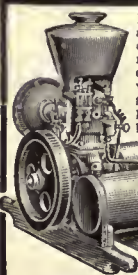
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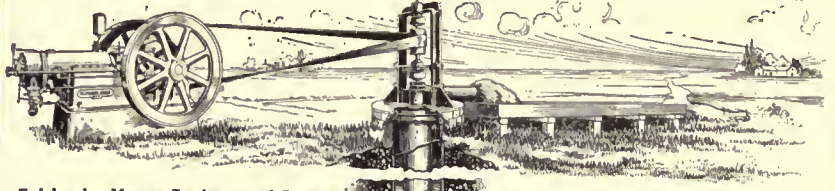
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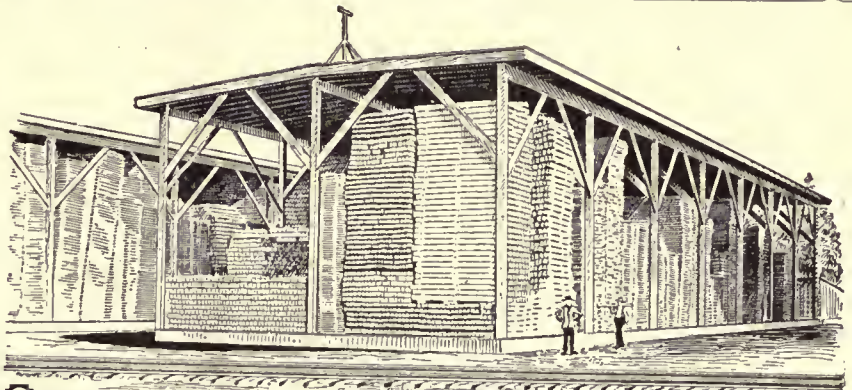


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"The heartwood varies in color from a light cherry to a dark mahogany. The narrow band of sapwood is almost white. The wood is

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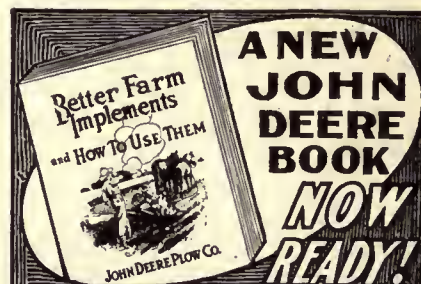
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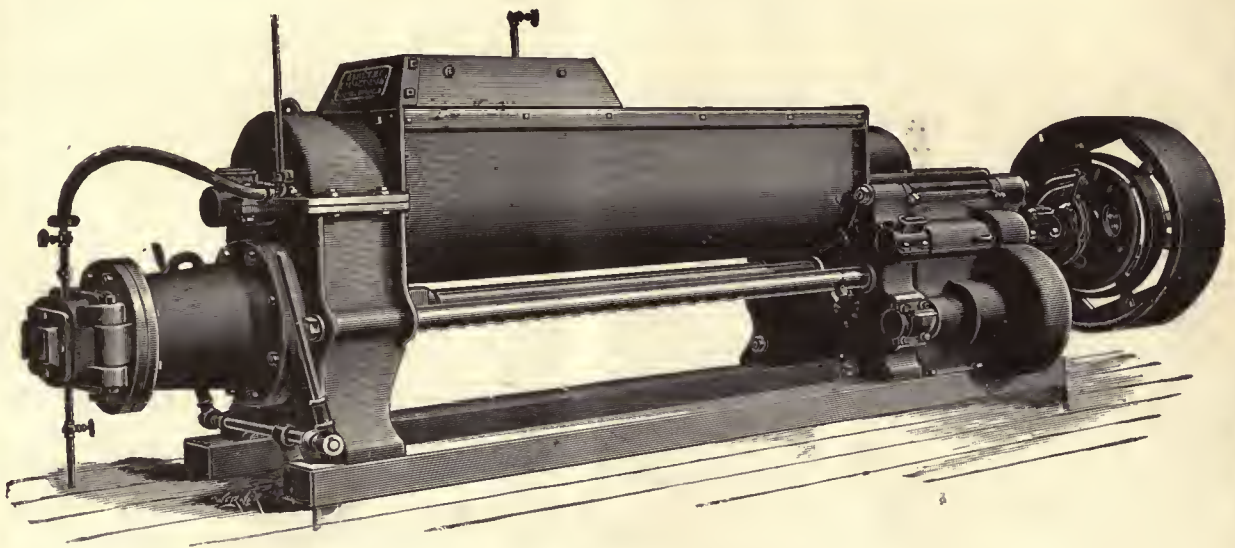
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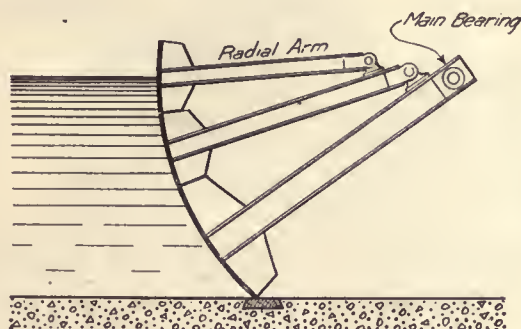
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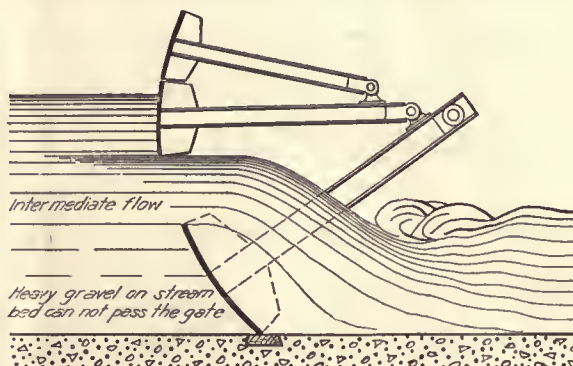
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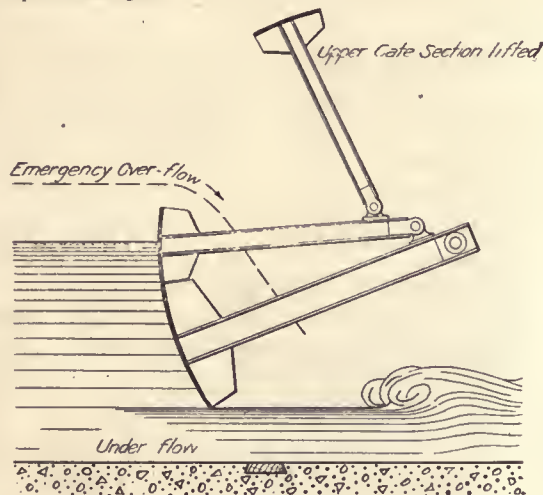


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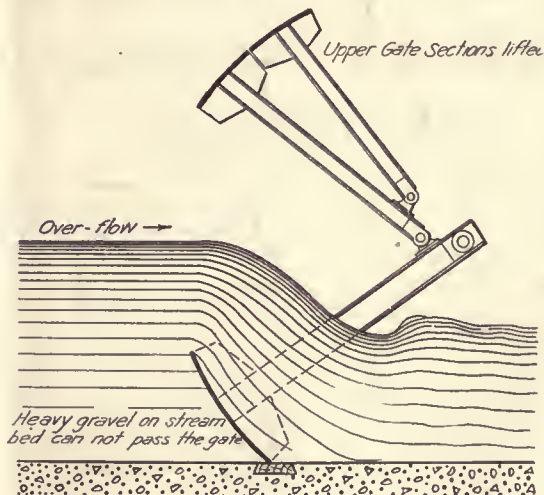
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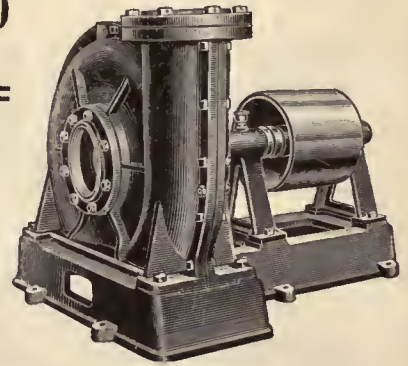
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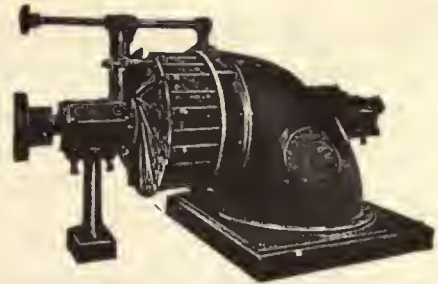


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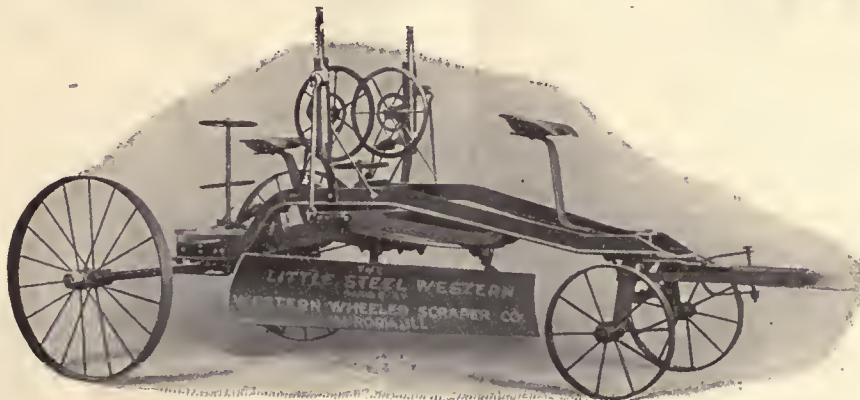
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Twenty-Eighth Year

THE IRRIGATION AGE

VOL. XXVIII

CHICAGO, DECEMBER, 1912.

No. 2

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

D. H. ANDERSON
PUBLISHER,

30 No. Dearborn Street, CHICAGO
Old No. 112 Dearborn St.

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D. H. ANDERSON, Editor

ANNOUNCEMENT.

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only publication in the world having an actual paid in advance
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old and is the pioneer publication of its class in the world.

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American Machinery Wanted In Australia.

On our correspondence page in this
issue will be found a letter from Mr.
Thomas Bunbury of Ballendella, P.
O., Rochester, Victoria, Australia,
in which he gives some information
concerning the development of that
country. We are pleased to note that Mr. Bunbury
will send us matter regularly from his section of
Victoria for publication in the columns of the IRRI-
GATION AGE.

Our readers who are interested in certain lines
of machinery about which he makes inquiry, will do
well to correspond with Mr. Bunbury, as there is
likely to be a good field open for this class of ma-
chinery throughout all Australia as development
goes on.

We note with pleasure that Major
Maj. Fred Reed Fred R. Reed of Wendell, Idaho,
Appointed has been appointed Commissioner of
Immigration Immigration, Labor and Statistics
Commissioner. for the state of Idaho by Governor-
elect Haines. This is very gratify-
ing news and we are very glad to know that the
ability of Major Reed has been recognized in this
manner.

Governor-elect Haines states that in selecting

Major Reed, he had in mind the selection of the one man in the state of Idaho who is best fitted by nature, ability and training to satisfactorily perform the duties of this important office.

Major Reed has done as much as any one man to exploit the resources of Idaho and has been identified with all of the development along the north and south sides of Snake river in what is known as the Twin Falls country. He has been in the West for about thirty years and is considered authority on irrigation affairs.

**Controversy
Over Grand
Valley Project,
Colorado.**

Mr. T. C. Henry, in a communication to a Denver publication, dated at Grand Junction, Colorado, offers severe criticism of the Reclamation Service in connection with the High Line canal of that section.

Mr. Henry states that one F. T. Pyle, "another reclamation expert," is in that vicinity studying soil conditions under the canal, and that he has progressed far enough to announce that it will be the policy of the government to require the homesteaders to deed back to the government at least 120 acres of their 160-acre filings, and that ten or even five acres in that vicinity are sufficient for the needs of an ordinary family.

Mr. Pyle has also, according to Mr. Henry, stated that the acreage unit should be reduced to that approximate minimum on account of the great cost of the project.

Mr. Henry further states that if Mr. Pyle's ideas are adopted, the outcome will constitute the most unique outrage on the rights of innocent people so far perpetrated by the United States Reclamation Service. He also states that a large amount of government land had been filed upon as homesteads before the reclamation service appeared in the Grand Valley eleven years ago, and before the lands were segregated in connection with the High Line project.

These homesteaders, so it is stated, have never been permitted to prove up and obtain patents on their lands, nor can they leave their claims without hazarding their rights. They have held on all these years waiting for government water, and it is asserted that they are in many instances in a sorry plight.

The final cost of this project is a conjecture. The attitude of the government in the High Line canal is annoying the people of the Grand Valley owing to the fact that the Water Users' association in the El Paso Valley, Texas, under the Engle reservoir expressly stipulated in their contract with the government that their holdings of deeded land

should not be reduced below the 160-acre limit. The Grand Valley people claim that this is a form of favoritism that should not be tolerated.

Mr. Henry, who is raising the principal objection to this work, is a man of large experience in irrigation affairs throughout the West. He started in central Kansas many years ago and subsequently moved to Colorado, where he carried to a successful finish a number of projects, and he is generally acknowledged as authority on irrigation and development work throughout the western states.

**Irrigation
Situation
Demands
Consideration.**

The manipulation of fake concerns and the unsuccessful operation of other companies, have caused heavy loss to investors and done much to bring irrigation in many of the western states into disrepute, and in a recent issue of the Olympia, Wash., *Olympian*, we note an article which says the irrigation situation in that state demands the serious consideration of the legislature to the end that proper safeguards be provided for the investing public. It is suggested that a law be passed which would compel all irrigation companies, before being permitted to do any construction work or sell any land or, in fact, transact any business whatever, make written application to the local state commission, setting forth therein in detail, their entire project, giving the estimated cost thereof, and stating fully the methods to be employed for financing the same, the form of contract under which they propose to sell land and water rights, etc. The commission would then have its experts make a thorough examination of the project, examine thoroughly the soil of the tract, estimate the quantity of water necessary to successfully irrigate the same, and determine what would be a reasonable maintenance fee to be charged by the company.

If the project is not feasible, or its financial standing unsatisfactory, the commission would withhold its approval and refuse the company the right to commence business. On the other hand, if all conditions, including financing the project, are satisfactory, a certificate of approval would be issued.

It is the opinion of those who are working for the passage of this law that it would be of immense benefit to the companies who are doing business on sound principles for the reason that the approval of the state commission would be a good advertisement, and facilitate the marketing of the bonds.

It is clear that the purchaser of arid land is the one who suffers the most, because of the dishonest management of blundering calculations of irrigation companies. The purchaser is generally

ignorant of the intricacies of the irrigation business, nor does he generally have the means to secure complete financial and engineering data concerning the project in which he invests.

This move is along the line suggested by the meeting of the railroad colonization agents held at Chicago and later on at Salt Lake City in October of this year, with the difference that the plan suggested there was that a general clearing house of information be established where each state could supply data concerning projects within its limits to this central institution, which would, in return, furnish sufficient information to intending settlers to permit them to go about the purchase of a farm-home intelligently.

Wearing Out of Earth's Surface Shows Appalling Figures.

A recent bulletin of the United States Geological Survey informs us that the earth's surface is wearing out and we are presented the statement that 783,000,000 tons of matter are carried away annually by streams.

The surface of the United States is being removed, according to this bulletin, at the rate of thirteen ten-thousandths of an inch a year, or one inch in 760 years.

Though this amount seems trivial when spread over the surface of the country, it becomes stupendous when considered as a total, for more than 210,000,000 tons of dissolved matter and 513,000,000 tons of suspended matter are transported to tide-water every year by the streams of the United States. This total represents more than 50,000,000 cubic yards of rock substance or 610,000,000 cubic yards of surface soil. To illustrate more clearly, this quantity, the bulletin states, "if this erosive action had been concentrated upon the Isthmus of Panama at the time of American occupation, it would have excavated the prism of an 85-foot level canal in about seventy-three days.

Amounts removed from different drainage basins shows interesting comparisons. In respect to dissolved matter the Southern Pacific basin heads the list with 177 tons per square mile per year, the northern Atlantic basin being next with 130 tons, while the rate for the Hudson Bay basin is only 28 tons. Amounts are generally lowest for streams in the arid and semi-arid regions because large areas there contribute little or nothing to the run off. The Southern Pacific basin is an important exception to this general rule, presumably because of the extensive practice of irrigation in that area. Amounts are naturally highest in the region of high rainfall.

Primer of Irrigation Used as Text-Book in Hawaiian Schools.

We note in a recent copy of the *Omaha Bee*, a statement concerning the use which is being made by the Union Pacific railway of the PRIMER OF IRRIGATION, published by the IRRIGATION AGE.

The article states that although not in the school book publishing business, the Union Pacific railway is supplying free of cost, the public schools of the Hawaiian Islands with some of their text-books, particularly the PRIMER OF IRRIGATION, a 257-page publication.

The PRIMER OF IRRIGATION, many thousands of which were purchased from the IRRIGATION AGE by the Union Pacific people, not only deals with irrigation in all countries and under all conditions of circumstances, but discusses the kinds and varieties of crops best adapted to different localities.

In the agricultural department of the Hawaiian schools the PRIMER OF IRRIGATION has been adopted as a recognized authority of all subjects treated and discussed.

The Union Pacific railway is also sending out other literature among which is "Fossil Discoveries in Wyoming." This work has been adopted as a text-book in the colleges of the United States and abroad.

It is very gratifying to learn from the *Bee* that this work is being carried along, as it speaks well for a book that the IRRIGATION AGE has been publishing for the past nine or ten years. We have already sold 30,000 copies of this work and the demand is rapidly increasing. It is hoped that later on, as the work becomes better known, it may be adopted as a text-book in schools throughout other countries.

Secretary Fisher Offers Recommendations.

In the annual report of Secretary of the Interior Fisher is found many recommendations and, taken altogether, is an interesting document.

The principal recommendations made by the Secretary are the adoption of a comprehensive water power policy for all streams of the United States; comprehensive classification of public lands and administration in accordance therewith; enlarged application of leasing principle to the public domain generally; amendment to mining law giving prospector exclusive right for a term of years of possession and prospecting within a limited area; legislation for development of transportation facilities and coal lands of Alaska; comprehensive leasing law for coal, oil and other mineral lands; withdrawal from entry of all

public lands in the West to protect headwaters of streams. A definite and comprehensive water power policy for streams in the public domain or otherwise is urged as the most important subject pending before Congress and the country.

The tendency of the full report is to carry on the idea of conservation and its recommendations on these subjects are definitely and clearly set forth.

Secretary Fisher is, no doubt, finding it difficult to get action on these various subjects owing to the mixed condition of affairs in his department prior to the time of the appointment of his predecessor, Secretary Ballinger. It has always been the opinion of the IRRIGATION AGE that Secretary Ballinger would have made good headway in reforms along certain lines had he not been hampered by criticism within as well as outside of the department.

It is well known that the Pinchot-Garfield crowd used every effort to belittle Secretary Ballinger's work, and finally the Secretary withdrew under this concentrated fire and Mr. Fisher was given the office, with the idea, it is presumed, to promote harmony and secure better work among bureau heads in the department, as well as by the withdrawal of severe criticism of the department by leading journals throughout the country who were evidently attempting to support and re-establish conditions existing under the old regime.

President Taft, in his letter of acceptance to the resignation of Secretary Ballinger, expressed himself very clearly and forcibly on this subject. The President had been in touch with all of the conditions connected with this controversy and was, no doubt, fully informed as to the various opposing forces under the Ballinger tenure of office.

Secretary Fisher's recommendation as to enlarged application of the leasing laws as applied to the public domain in general, is one that merits the consideration of all who are interested in western development.

Concerning a water power policy, he says that it must be made certain that those who receive special privileges connected with water power development shall, in fact, proceed by appropriate degrees and within appropriate time to develop the available water power to its highest capacity, having due regard to the possibilities of marketing the power produced.

We note in scanning this report, that Secretary Fisher fails to mention instances where settlers on specific areas in the West are being hampered by decisions which retard their development. As an example of how some of the business of the country is being handled by the department, we will cite the fact that on February 23, 1911, President Taft

ordered the restoration of the Owens Valley, California, lands then held as alleged forests. That order is still on file somewhere without any action being taken by the Department of the Interior.

Complaints reach us from time to time from this section, and it is stated that judging from the course of things heretofore it is not unlikely that this order of restoration will remain ineffective so long as there is a chance for the larger money interests of Los Angeles to secure a continuance through congressional action, of its domination over the development and future of that valley.

It is possible that in handling larger subjects, Secretary Fisher has not had his attention called to this particular case.

The fact remains, however, that this condition is hampering the development of Owens Valley, as the records will show; a case of that kind should be made public either through the secretary's report or by special exploitation, thereby giving the public generally a clear and full knowledge of the efforts which are being used by department heads to circumvent the efforts or will of the higher officials.

It is not known just what means the people of Los Angeles will take to secure its standing with the new administration. That city was the "Bull Moose" headquarters and stronghold in the state of California, and is not in a good position to ask favors from the incoming administration.

We will look for some good work by Secretary Fisher during the remainder of his term. It may not be out of place to suggest, however, that he could secure a lot of valuable data to the department by an investigation of the taking over of the water power of the western slopes of the Sierra Nevada and Cascade ranges, as well as some of the work that has been carried out along numerous other streams in Idaho, Montana and Washington.

Careful investigation of the control of available water powers along the Snake River in Idaho, would furnish good material for the public to digest.

BIDS WANTED.

The director of the Reclamation Service is asking for proposals for the constructing of two miles of the Dodson North canal, Milk river irrigation project, Montana. The work involves the excavation of about 205,000 cubic yards of material, and is situated on the north side of Milk river and adjacent to the main line of the Great Northern Railway near Wagner and Exeter. The bids will be opened at the office of the Reclamation Service at Malts, Montana, on January 10, 1913.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.

The Importance of Water Measurement and Accurate Records of Delivery*

By Samuel H. Lea, State Engineer of So. Dak.

One of the most important problems that confronts the irrigation manager comprises the perfection of a method of delivering water that shall insure to the water user adequate returns, while making the greatest possible use of the available water supply.

The economical use of irrigation water is essential for obtaining the best results, that is where the net duty represents the best use of water. This is the case when only sufficient water is applied to give the best crop production and when the losses of percolation and evaporation are eliminated as much as possible by a skillful application of water and proper cultivation.

The necessity for using our water supply with due regard to economy is apparent to us all, and we realize that the situation is becoming more acute with the passage of time.

In the west there are vast areas of irrigable land awaiting agricultural development, for which there is only a limited supply of water. Of necessity, the available water supply must be used economically, so as to bring the largest possible acreage under the ditch.

It is universally conceded that the wasteful use of irrigation water results in overirrigation and consequent injury to crops as well as damage to the land. In the irrigated west there are hundreds of thousands of acres of land that have become waterlogged because of excess of water. While it is true that such excess is not entirely due to over irrigation, since a large percentage comes from seepage losses in ditches, still a considerable portion of it is due to wasteful use of water.

Another reason why irrigation water should be economically used is that better crop results are obtained where careful use is made of the water. Reports of the United States Office of Irrigation Investigations show conclusively that better crop production is obtained where just sufficient water is applied, than where a larger quantity is used. By economical use is meant making the available water supply go as far as possible, using only what is necessary to produce maximum crops without wasting the water or supersaturating the land. It is admitted that this is an ideal condition, requiring much patient effort to bring about, but still not unattainable.

We are all aware of the common tendency to waste water by users, and we also are more or less familiar with the water hog who infests irrigated sections. We are, doubtless, all agreed that the wasteful use of water under present irrigated methods is a condition to be deplored and for which some remedy is required.

Until within a comparatively recent period irriga-

tion methods were but little different from those followed by water users of ancient times. For centuries there was very little advance in methods of applying water for crop production. Fertile valleys were made into swamps by wasteful methods of handling water, and the duty of water was reduced to an unsatisfactory minimum.

We have now advanced to the point where better results are demanded in the way of water transmission and storage as well as in the net duty of water for irrigation. Modern conditions demand a more intelligent use of water in irrigation operations, and in order to accomplish this we must regulate the water supply so as to furnish the proper quantity without waste or unnecessary loss.

The most feasible way to bring about the desired result in fairness to all is to measure the water used and to keep accurate records of its delivery to consumers.

On the large irrigation projects and as the water becomes more valuable, it is of increasing importance to keep systematic records covering the discharge of the main canals and laterals, the water lost by seepage and evaporation and the water returned to stream.

It is also important to determine the approximate quantity of water delivered to each tract of land. It is desirable to have in addition, the acreage in each crop and the yield per acre for the individual water users. With these records the irrigation manager is in a position to introduce important economies in handling the water, reduce water losses, and he can meet complaints of water users with the facts as to actual quantities of water delivered between given dates.

By measuring the water and keeping a record of its delivery an effective means is provided for determining losses in transmission through canals and supply ditches. In many cases, where seepage losses are excessive, it may be found advisable to prevent these by using an impervious lining for the ditch, thereby saving valuable water. Where costly diversion works have been constructed it is reasonable to expect that the water supplied at headgate should be delivered without serious loss.

In the distribution of irrigation water contracts are frequently made on an acreage basis. So long as users are permitted by their contracts to take all the water they consider necessary to irrigate an acre of land there can be no economy in the use of water, for whenever there is a full ditch, those under it will endeavor to use as much as possible for their respective needs.

Many engineers claim that the only way in which water can be economically used is to measure out the quantity to which each user is entitled and permit him to make the best possible use of what he has purchased. If it is to the interest of water users to save the water which they receive from the ditch, the water now used and wasted on western lands will be sufficient for a much larger area.

The following argument in favor of the recorded measurement of water is advanced by an eminent hydraulic engineer:

First, metered service pleases the economical con-

*Paper read at meeting of Irrigation Managers U. S. Reclamation Service, Ft. Collins, Col., Dec. 5-6, 1912.

sumer, since he knows he is paying only for the water he actually uses, and is not called upon to share the burden of that wasted by his careless neighbor, as well as the charges on the increased equipment and maintenance necessary to provide the wasted supply.

The time honored method of selling water for irrigation is by means of a designated rate of flow running either for the season or for a designated day or number of days, or else as an aliquot part of the total amount flowing in the main canal. But human nature is the same, whether influencing the draft of water for irrigation purposes, or for that on the many other uses to which man puts water; and so long as the user has no pecuniary interest in saving water—in causing the least amount to satisfy his needs—so long will he waste it, even if it be only for the satisfaction of letting water that has been paid for run upon the ground.

The practice of measuring specific quantities of water delivered to consumers when applied in the conduct of municipal water works or of power canals, has universally resulted in a very great economy of water. When water is charged per plumbing fixture, for example, or by flat rate for a given period of time, the consumer has no pecuniary interest in keeping his fixtures in order, or even merely closed when not using water; and waste grows to large proportions.

When water is paid for by measure, use goes on as before; but waste is stopped because attention is drawn to it with every quarterly bill rendered and it has become too costly to continue.

The same procedure would apply to irrigation water when paid for by measure; or when the water user in some manner is made to have pecuniary interest in being economical in the use of the water he may lawfully draw.

The statement is made that about one-half the water used for irrigation could be saved for the irrigation of another like quantity of land. Whether this be true or not the consideration involved is of great importance. If it be true that as much as one-third of the irrigation water could be saved, the cost of the whole irrigation plant would become chargeable to a largely increased number of water users, thus materially reducing each one's share of the original expense. Under such conditions a community could afford to pay for automatic registers that would enable this larger area of land to be irrigated as much as one-third of the cost of the diversion works and yet have the satisfaction of having increased the welfare of the state without increased cost to themselves.

The relative value of irrigation as compared with dry land farming is stated by Professor Winsor as follows: "An arid farmer does exceptionally well if he clears ten dollars per acre, while the irrigation farmer with an ordinary crop of oats can clear sixty dollars an acre on the same kind of soil. The increase, then, of 600 per cent is due not to the farmer nor to the soil, but to the irrigation water, thus making the water five times as valuable as the soil, and with the more intensive farming thus made possible, the returns due to the water sometimes reach fifty times the returns from an equal area of arid land."

(Continued on Page 56.)

PREPARATION OF SEED-BED FOR ALFALFA.

There will be considerable land seeded to alfalfa in the next few months. A few hints along the line of preparing the seed-bed may help the farmer to obtain a good stand. The necessity of preparing the land properly before the seed is sown cannot be emphasized too strongly, for one should not expect to secure a good stand of alfalfa if the land is poorly leveled and the clods left unbroken. The farmer who spends time and capital in the preparation of his seed-bed is the one who will reap the greatest profit on his land.

In the first place see that the land is level; that is to say, have the field in such a shape that the water when irrigating will stand at a uniform depth over the entire plat or border. The danger of killing the alfalfa by too much water in the low places is thereby eliminated.

Have the land leveled so that the use of many cross borders will not be necessary. These are not only an annoyance in mowing but cause the mower to depreciate in value rapidly, and numerous cross borders afford a place for weeds and grasses to get a start.

If the land has never been in cultivation it is well to seed the land to an annual crop such as corn or wheat for the first year, and in this way determine whether or not the land is level. It will always be found that the land will need re-leveling, dragging off the high spots and filling the low ones. However, if it is essential that the alfalfa be seeded the first year, the land should be bordered before seeding and irrigated, and the levelness of the land determined.

After land is properly leveled before the seed is sown, consider the texture of the soil. If the soil breaks up cloddy some instrument such as the disc harrow or the clod crusher should be used to pulverize the soil thoroughly. Have the soil in such a condition that every seed that is sown will have a fine loose soil in which to send its roots. A more uniform stand of alfalfa may be secured on a well pulverized soil. Less seed per acre will be required on such a piece of land for all the seeds are in a position to take root readily and grow. On a soil that is cloddy some of the seeds will fall in cracks and others on clods. In the cracks the seeds will be piled up much thicker than necessary, while the seeds that fall on clods may not receive sufficient moisture to insure germination.

RENEW. YOUR SUBSCRIPTION

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.

HOLDEN LEAVES IOWA.

The "Corn Man" Joins the I. H. C. Service Bureau to Help Push Forward a Work of Endless Worth.

This marks the beginning of a new and greater business service. It is a co-operative movement for larger crops, better roads, happier homes, more prosperous people, and a richer and better nation. That is to say, the I. H. C. Service Bureau proposes to help do for all the states and for Canada what Holden has done for Iowa.

After considering many offers, and after an investigation of the company and its work, Professor Perry G. Holden has entered the service of the I. H. C. Service Bureau, at Chicago.

Professor Holden is known wherever real agriculture is known. His whole life is one of service. He originated the idea of carrying information direct to farmers. He is the father of the demonstration train, short school courses, the corn show, county demonstration farms, and the National Corn Exposition. As head of the extension department of Iowa State College of Agriculture he did a work, which, Senator Cummins says, up to the present time has increased the wealth of Iowa \$30,000,000.

A little more than two years ago the International Harvester Company of America established the I. H. C. Service Bureau. Already it has done much work of real value. But, better still, it has made careful preparations for a work, which, it would seem, is of far greater service to humanity in general than anything ever before undertaken by a business organization.

The object of the bureau is the promotion of agricultural education, and a co-operation which will tend to raise the whole tone of commercial, industrial and farm life. Since agriculture is the basis of prosperity and progress, naturally farm problems claim first attention. The aim is higher efficiency, both on and off the farm. And this is to be brought about through an improvement of material, social, intellectual and moral conditions.

To do a big work a big organization is necessary. Not alone the bigness, but the perfectness of the International organization as well appealed to Professor Holden. In its well-oiled machinery he saw the means for accomplishing an end. The entire organization is to be enlisted in the service work. The big general agencies, scattered all over the United States and Canada; the salesmen, travelers, and expert machine men; the 40,000 dealers—every one, so far as possible, is to be made an apostle of better farming.

For years the Harvester Company has realized the importance of service. It has spent millions of dollars in the perfection of labor-saving machines, and it has sent men out into the fields to show farmers how to operate these machines. It has loaned machines to schools and colleges, and it has distributed tons of literature, packed with the latest and best farm information. And last, though first, the invention of the reaper, which founded modern agricultural greatness, also founded this

company. Agriculture and the International Company have grown up together, and together they have prospered. But heretofore the service rendered was more or less indirect. Now the company is going in for direct service—direct to the farmers, and direct to the farmers' children, that the men and women of tomorrow may be more capable and so more prosperous than the men and women of today.

It is no longer a theory that if we are to get the most out of life we must raise more per acre. "Intensive farming" is in the air. It is the battle cry of peace and plenty. But raising more is the result of mind, not muscle. We must know. And not only that, we must know we know, and know why we know. We must know good seed from bad,



Professor Perry G. Holden.

right cultivation from wrong, and the whys and wherefores of climates, soils, fruits, cattle, horses, poultry, and so forth. All this will add to the wealth of the farmers. Wealthy farmers make prosperous communities, and a nation is but an association of communities. At the heels of prosperity follow education, conveniences, social intercourse—everything that makes life more worth the living. These things were growing up in the mind of Professor Holden at the time he was helping to grow an average of three more bushels of corn to the acre in Iowa. And these are the ideals of the I. H. C. Service Bureau. For these things the bureau was established. But the bureau and Professor Holden see more than an average increase of three bushels. They see a time coming when farmers will raise twice as many bushels of corn, wheat

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CORRESPONDENCE.

The Bungalow, Ballendella, P. O.,
 Rochester, Victoria, Australia.
 The Editor of IRRIGATION AGE,
 Chicago, Ill.

Dear Sir:

In your September number I note with pleasure your account of our Mr. Mead's statements, while in your country, on Australia's advantages to the settler, on irrigation blocks, etc. I also note the lifelike photo of him.

Mr. Mead is one man up in this district, which is one of many new irrigation settlements, and I suppose if it had not been for his coming to this country and accepting the post here he did, and doing the work he has done, we from over seas, neither should have come here either, especially as his statements and those of our Minister of Lands, the Honorable Hugh McKenzie at home, were mainly instrumental in bringing us. Most of us from the old country have come with the real and only desire to succeed and make our homes here, and to that end we look to your Mr. Mead for his great experience, coupled with our energy, to make this undertaking a great and lasting success for all concerned. It is conceded by all here that Mr. Mead is a great man, has the courage of his convictions in this great scheme, and not only that, but which is more important for us who have come 12,000 miles and more, our interests at heart, as naturally, if we don't succeed, neither can the undertaking, so that, coupled with other assistance which is being given and promised by those in authority, should help in a short time toward the desires, hopes and aims we left our homes and friends for.

I have found many helpful articles in your paper and I would now suggest others which will be further so—such as one on how to start and establish canneries for vegetables and fruits, the probable cost, etc. I also vote that you write largely on alfalfa meal, which makes such splendid feed and sells your way at \$36 a ton.

This meal business should prove a most helpful adjunct here, therefore, can you let me know cost of a mill, where to get one, and whether, if we make the meal here, it would pay us, failing a market here, to ship it to your parts. As large numbers of alfalfa stacks will be on the grounds here soon, an early and detailed reply will greatly oblige.

I hope soon to write you, regularly, articles on our progress here and ask for further advice, which I trust you will be kind enough to give.

I am, sir,

Yours faithfully,

(Signed) THOMAS BUNBURY.

Wendell, Idaho, Dec. 15, 1912.

THE IRRIGATION AGE,

Chicago.

Gentlemen:

The United States Government, after exhaustive investigations, has finally determined upon the location of a potato experimental farm near the town of Jerome, Idaho, on the Great Twin Falls North

Side Project of southern Idaho. Forty acres of land were donated by Messrs. Kuhn Brothers to the Government for their experimental work, and the North Side Project is to be congratulated upon having the soil and conditions that make it worth while for the Government to establish its experimental station here.

Mr. Eugene Grubb of Carbondale, Colorado, of potato fame, has been tireless in his efforts to bring before the public the wonderful possibilities of this section for the growing of high class marketable potatoes, and several weeks ago, in company with Dr. Orton and Dr. Corbett of the Department of Agriculture, were in the field looking over a proposed Government site, and making other investigations, and a gathering of the people of the North Side Tract from the towns of Wendell and Jerome was called for a discussion on potatoes.

Dr. Orton was the first speaker, and his remarks, in part, were as follows: "My own field is that of 'Plant Diseases.' In our work at Washington we have given a great deal of attention to potato diseases. Our work has been principally in the eastern states, but in recent years largely in the West. There is no work so important as the Pathological side of potato growing, and in the West is one of the most important parts of this industry.

"I want to mention to you some things that have happened in other potato growing districts. I believe you have here in this wonderfully fertile district, one of the greatest possibilities that have ever been presented to any agricultural community, in that you are beginning in virgin soil the cultivation of a crop, which, in other districts, has suffered greatly from plant diseases. You are beginning in soil entirely free of these troubles. It rests largely with you as to whether you shall continue potato growing free from these handicaps.

"Let us take, for example, Greeley, Colorado, one of the most famous of the potato districts, which has been built up by growing potatoes to the point where it is one of the wealthiest of the western districts. Greeley, a few years ago, was growing 35,000 to 40,000 acres of potatoes. A year ago the crash came at Greeley, and the production fell from seven to ten thousand cars down to 500 cars.

"The cause of this is purely a question of plant disease. It is very questionable whether they will be able to get back, at least in a few years, anything like their normal production.

"The trouble in Greeley has been somewhat complicated. Possibly the heavy soil has had something to do with it. Possibly continuous rotation in alfalfa, and the presence of nitrogen—forming bacteria in the soil has increased the nitrogen content of the soil too much, but whatever those factors may be, the condition present is one of disease.

"Another district in the West which has had a great deal of fame is that around Stockton, California,—the beet land section between Stockton and San Francisco, below the river level. When this river district was first opened up, the crop of potatoes was something wonderful, and the farmers desired to make all they could growing potatoes continuously. After a while the yields began to

fall off, and a discovery by the Department of Agriculture proved that a wilt or fungus disease was responsible for the depreciation of the crop. Those people have gotten all their lands infested with this disease. They also have scab disease thoroughly distributed on these lands, and their work, now, is to get those lands back to their former condition by some rotation or other treatment.

"A new district in Southern Nevada which has only been opened for agriculture a few years, has been infested with a serious disease. They have brought in potatoes from other districts without any particular attention being paid to disease infection. The result is their lands have been infested with eel worms, a minute worm which causes knots on the roots of the plants and causes rough potatoes. When you get the eel worm into irrigated lands, it is extremely difficult to get it out.

"What have we to face here? There are, affecting potatoes in the United States, at least a dozen different diseases sufficiently serious to require the careful attention of one section or another. Some of them will never occur here. The late blight, or rust, of New York, Maine and Michigan, will never occur in the Snake River Valley, because it only thrives in a humid climate. There are three diseases, however, of sufficient importance to bring before you, which we found in your fields today.

"The most common trouble, here, in the irrigated districts, is sun blight. This disease causes brown spots on the roots, especially on the part of the stem just below the surface, and also a formation on the stem just below the surface, and also a formation on the stem of aerial tubers. This, however, does not always produce this effect. It frequently takes the underground root, in which case, quite often, the potatoes are cut off and fail to grow. This you will find very common in your fields here.

"The second form you will see on a great many of your potatoes, small black patches which stick very closely to the skin, but may be rubbed off with the finger nail.

"The third form you will find in the nature of a white covering on the green stem which is below the soil surrounding the plant. This disease, so far as we know, may be due to the character of soil, to the water supplied, and to other factors which are not fully known to us, but it can be controlled by the manner of irrigation, so you will have at all times not too much water applied, but keep the soil open to the admission of air, and attention paid to the building up of the humus side of the soil. This disease will be much more serious than any other disease you will have here.

"All districts suffer more or less with scab. This disease, in the East, is controlled by attention to two factors: First, that the seed shall be treated in formaldehyde to destroy infection before planting. Do not plant potatoes without treating them. Remember, also, that the disease is also carried in manure, and I think it very questionable whether to apply fresh manure on a potato crop.

"The disease, for example, found in Greeley, Colorado, I am confident, in the end, will be controlled, not by any expensive treatment, but by the

method of seed selection. A great deal of attention should be paid to the introduction, right here, of new varieties of potatoes thoroughly adapted to your local conditions. I believe, when you have done potato breeding here and have such varieties that the tendency towards diseases, which are found in most of the western districts, will largely disappear. I believe that by breeding and seed selection you can keep your diseases under control, with the exception of wilt and scab, which are largely due to fungus infection."

Dr. Corbett's remarks were confined to seed selection and to the importance of every potato grower starting to grow his own seed, selecting the best seed according to the ideal type being produced.

Mr. Eugene Grubb was then called upon to speak, and his remarks were, in part, as follows: "Just a few points of observation today that will be well for you to consider: All over Europe the first essential for growing potatoes is drainage, and deep trenching on the North Side Tract is good drainage. We have found in Colorado that potatoes deeply trenched and highly ridged; potatoes grown in cool, porous soil, were free from disease, because all of the low, flat hills, which were excessively irrigated and caused the soil to be waterlogged, is where the rough potatoes were found. Deep tillage, deep trenching, frequent, but light waterings and short irrigation rows are producing the best results in Colorado.

"Among other things, get your potatoes started strong and vigorous, and that means large seed pieces. Talking whole seed to people without experience is dangerous, but all over Europe, absolutely without exception, I found no successful potato grower but what used whole seed.

"I wish we could demonstrate more fully to you the need of less water. The potatoes that have been going to Chicago and Pittsburgh from this section have excelled in price the potatoes grown from any other section on account of the quality, but if you continue this profuse irrigation, you will soon lower the quality of your potatoes and bar you from reaching the markets at any distance from you. The tuber does not take up any moisture. All that is necessary is to furnish water to the feeder roots.

"Many fields we have been in today we found potatoes which were sunburned because they were not covered up sufficiently. When you trench deep you throw the soil on top of the hill. It covers the tubers and keeps them from being sunburned.

"In Wisconsin, Minnesota and Dakota I find no farm storage. The potatoes that should be marketed during six to eight months are thrown on the market in a short space of time. The markets have not storage facilities and you break and panic the market. With storage on the farm, shipments can be made from September until the middle of June, and you will not always be at the mercy of the potato broker. There should be some method made here for the storage on the farm where you can sort and grade your potatoes in the cellar in the winter months, and not at the busy time, and I think it not impossible that much of your troubles

come from imperfect storage of your seed stock. You cannot control them in pits, and until you have storage where you can control the temperature, you will have continual trouble with seed potatoes. I think some movement should be started here—if individuals are not in financial condition to build an individual storage—farmers could co-operate to build a storage cellar together, and in that way even up the marketing and control of your potatoes.

"There is no industry now on the farm that looks to me so bright as the potato industry. We are dependent on the work of the American farmer.

"If you can keep your soils free from disease and follow the plans of Dr. Orton and Dr. Corbett as to seed selection and plant work, and grow your own seed on those methods, you will double your output, and there is no crop grown on the American farm that will make so much profit for capital and labor as the potato business in the future. Nowhere on the globe have you such favorable conditions for growing the highest quality and greatest yield of potatoes as you have in the Snake River Valley, Idaho."

Certainly these remarks were much appreciated by we new people in this new and wonderful agricultural section of southern Idaho.

Yours truly, FRANK S. REID.

MONTHLY DIGEST

Of Important Points Recently Decided by the Secretary of the Interior.

HOMESTEADS.

It is not residence within the meaning of the homestead law for one to return occasionally to his land while habitually absent engaged in a vocation necessarily requiring his absence.

An entry made upon land, subsequently withdrawn but later restored, has the same effect upon the entry as abandonment, and the entryman must therefore be governed by the general homestead laws.

FINAL PROOF.

The mere fact that final proof is regular does not bar the land department from proceeding against an entry for failure to comply with the law. The final proof is merely claimant's assertion, which is not conclusive upon the Government.

The land department has ample authority to investigate into the truth of final proof upon an entry any time before patent issues.

PRACTICE.

The Department has the unquestioned power and has long exercised the same to order a hearing in any case irrespective of technical procedure, where justice to the parties seems to the Department to require that such hearing be had.

The Department has ample authority, under its supervisory power, to relieve against the inadvertance, mistake or deceit which resulted in the dismissal of a contest, notwithstanding the pendency of a junior contest on the same land.

The rules of practice have the force and effect of laws, and when not complied with, the omission is at the peril of the one violating these rules.

The Department cannot recognize the binding force upon it or upon the Commissioner of the General Land Office of any stipulation entered into at a hearing by special agents and attorneys for parties in interest, which may preclude the consideration in the case of any question vital to the validity or regularity of the claim.

In making withdrawals and classification of large areas of land, the Government finds it impracticable and unnecessary to determine as to the status of each particular tract covered thereby, and that frequently areas to which inchoate rights are being asserted, and even patented tracts, are included in such withdrawals and classifications. The fact that a certain tract happens to be described in a list of lands withdrawn or classified does not of itself determine the ownership or in any manner affect the title thereto.

DESERT LANDS.

The reclamation act of June 17th, 1907, only permits homestead entries to be made on the express understanding that they will be reduced to the area determined by the Secretary to be sufficient for the support of a family.

Public irrigable lands in reclamation projects are, under the letter and spirit of the reclamation laws, to be divided among as many families as the lands will properly and reasonably support. The assignment act of June 23rd, 1910, does not modify this requirement, but, on the contrary, expressly imposes it upon assignments.

The reclamation required in desert land contemplates proof of a water supply sufficient and permanent as well as an irrigation system adequate and substantial under usual conditions for the raising of ordinary agricultural crops.



In the Potato Country—Roaring Fork Valley, Colorado.

EVOLUTION OF THE WAGON.

Primitive man carried his fire-wood and prey upon his back, or he dragged it along the ground when it was too heavy to carry.

The problem of better facilities for transportation was before him always. It confronted him when he was cold and when he was hungry.

The first attempt at solving this problem of transportation was probably to use his wife's back instead of his own for carrying his burdens. His wife, however, could not carry all he wished, so he pressed animals into his service to carry and drag his burdens.

Sledge.

In time, by the slow process of evolution, the sledge appeared. The sliding friction of the smooth sledge was less than the friction caused by dragging the burden directly along the ground. The energy this required to overcome was less than the energy required to overcome the weight of the burden by lifting it bodily and carrying it. Attaching animals to the sledge in place of his wife, or to help his wife, naturally followed.

A crude form of sledge, but fully embodying its principles, was used by the North American Indian. He attached a pole to each side of his pony with the ends of the poles trailing along the ground behind. Across these poles or runners the load was fastened.

Roller.

Evolution in transportation next gave us the roller which substituted rolling friction for the sliding friction of the sledge.

The great advantage of the roller is exhibited in the transportation of heavy bodies such as enormous blocks of stone as used in the construction of the pyramids. Ancient Egyptian pictures show sledges mounted on rollers.

As a means of ordinary transportation in which the element of time is important, the roller had one very objectionable feature. As the load moved forward, drawn by man or other power, the roller was left behind, and it was necessary to constantly place rollers under the front portion of the load or framework on which the load rested. To overcome this objection, rollers were permanently attached to the sledge or framework that carried the load.

Oxcart.

The reduction of the diameter of the roller, except at the ends, gave us the axle with wheels at either end, in principle the same as our axles and wheels on railroad cars. A later development was to attach the axle rigidly to the framework and fasten the wheels to the ends of the axle in such a manner that they could revolve.

This gave us the solid wheel which is still in existence on the old Mexican ox-cart in some of the remote regions of Mexico.

The next problem was to lighten the wheel and at the same time strengthen it, from which resulted the modern wagon wheel.

Wagon.

How many centuries or hundreds of centuries it took to evolve the sledge, the roller, and finally,

the wagon, is impossible to say, but it is certain that the most ancient people of whom we have any knowledge were in possession of the wagon. The ordinary wagon in use today is the same in principle as the wagon used by the Greeks and the Romans and the people who preceded them.

Details of construction have been improved, better materials used, but the underlying principles remain the same, that is, the rolling friction of the wheel on the ground and the sliding friction of the wheel on the axle.

The fact that a rolling friction is preferable to a sliding friction shows itself in that the roller followed the sledge.

Great improvements have been made in the direction of reducing the rolling friction on the ground by building better roads.

Smoother surfaces and better lubricants for the bearings at the axle, and, finally, the introduction of the roller bearing have greatly reduced the sliding friction of the wheels in the hubs.

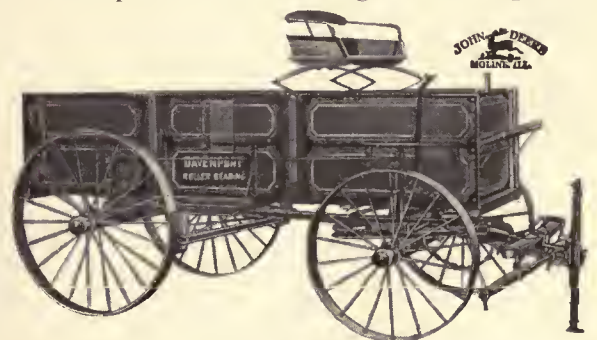
Roller bearings do away with the sliding friction in the hub and gives us the rolling friction. They have been applied with marked success on line shafting, on the axles of automobiles, and some agricultural implements like wagons, harvesters, mowers and manure spreaders.

The principle only requires the placing of rollers between the axle bearing and the hub bearing. As the wagon moves forward, there is no sliding friction of the axle bearing against the hub bearing, but instead the rolling friction of the rollers against these bearings.

Davenport Roller Bearing Steel Wagon.

Davenport Roller Bearing Steel Wagons are built entirely of steel. The only equipment that will stand the climate of the irrigated districts is made of steel. You know the reason—wood dries out, becomes useless and the machinery falls apart.

Davenport Roller Bearing Steel Wagons are



Davenport Roller Bearing Steel Wagon.

stronger, lighter draft and more durable. Each one will outlast several wooden ones.

They are built of I-beams, channels and angles riveted together with steel rivets put in while hot, making practically one solid piece. There are no bolts to become loose and no nuts to rattle off on account of parts shrinking and drying out.

Makes no difference what the climate is, it does not affect Davenport wheels. They are made with a tension, each spoke carrying its share of the load all of the time whether it is on the top, bottom or

(Continued on Page 54.)

Supreme Court Decisions

Irrigation Cases

RIPARIAN RIGHTS.

The fact that a tract of land touches a stream at one point does not make such land riparian at other points on the stream, or to the whole stream; but the riparian right of the owner of such lands is confined to the points where the land abuts upon the stream. *Miller v. Baker*. Supreme Court of Washington. 122 Pacific 604.

ADVERSE USE.

To establish title to running water against a prior appropriation, it is necessary to show a continuous use for 10 years under claim of title, and that such use deprived the person from whom the adverse title is claimed to have been acquired of water to which he was entitled, and for which diversion he would have a cause of action. *Little Walla Irr. Union v. Finis Irr. Co.* Supreme Court of Oregon. 124 Pacific 666.

DUTY TO SUPPLY WATER TO NON-STOCKHOLDERS.

Where a private corporation was organized to supply water to stockholders only, the fact that it furnished surplus water to another corporation as an accommodation did not confer on the customers of the latter the right to enjoin a discontinuance of the supply, on the theory that defendant thereby became a public service corporation. *Garrison v. North Pasadena Land & Water Co.* Supreme Court of California. 124 Pacific 1009.

METHOD OF APPLICATION.

Where old settlers acquired the right to use water for irrigation under the federal statute of 1866 and applied the same by inexpensive methods, they could not be required to install new methods that would reduce to a minimum the amount of water necessary, at a cost that would absorb their profits, because the method used was to some extent extravagant in the use of water. *Little Walla Irr. Union v. Finis Irr. Co.* Supreme Court of Oregon. 124 Pacific 666.

DITCH BECOMING A NUISANCE.

Under Const. art. 11, sec. 11, empowering any municipality to enforce within its limits local, police, sanitary, and other regulations, a municipal corporation has the right to require the closing of an open irrigating ditch which has, for more than the statutory period, been maintained at the side of a highway, such ditch having become a nuisance through the growth and development of the municipality. *City of Santa Ana v. Santa Ana Valley Irr. Co.* Supreme Court of California. 124 Pacific 847.

QUIETING TITLE.

In an action to quiet title to water rights, evidence that defendant purchased such rights from a former record owner of the lands to which they were appurtenant in reliance on the statements of the holder of an unrecorded deed that such record owner was the owner and could make such conveyance was admissible, although such facts were not pleaded as an estoppel, since, although they might have constituted

an estoppel, they also showed that defendant was a purchaser in good faith. *Sturtleff v. Bracken*. Supreme Court of California. 124 Pacific 724.

"NATURAL WATER COURSE."

Where surface water in a hilly region of high bluffs seeks an outlet through a gorge or ravine during the rainy season and by its flow assumes a definite and natural channel, and such has always been the case so far as the memory of man runs, such accustomed channel through which the water flows possesses the attributes of a natural water course. The flow of the water need not be continuous, and the size of the stream is immaterial. *Jaquez Ditch Co. v. Garcia*. Supreme Court of New Mexico. 124 Pacific 891.

RIGHT TO ENTER LAND.

The entry upon private property for the purpose of investigation, inspection, and the making of surveys, plans, and specifications for the purpose of making application for a permit does not necessarily result in the permanent taking of the real property of the owner, but it necessitates the entry upon such land, and the right to enter upon such land must be secured either by agreement of the parties, or by condemnation proceedings, and, without such remedy being pursued, the entry, if made, is a trespass. *Marshall v. Niagara Springs Orchard Co.* Supreme Court of Idaho. 125 Pacific 208.

SUIT AGAINST IRRIGATION DISTRICT.

Taxpayers residing within an irrigation district organized under St. Cal. 1887, p. 33, known as the Wright Act, cannot maintain a suit in equity to enjoin the prosecution of an action at law brought against the district on its bonds on the ground that the bonds are void, that the persons served are not officers of the district, and that it has no officers to represent it, and especially where it is not shown that any application has been made to the board of supervisors of the county to appoint directors for the district as authorized by section 10 of the act in case of vacancies. *Quinton v. Equitable Inv. Co.* U. S. Circuit Court of Appeals. 196 Federal 314.

SUIT AGAINST LAND OFFICE.

Where it was claimed that the United States had contracted for the sale of a water right under the Reclamation Act for the irrigation of certain lands entered by the complainant and situated within the district of lands compromising a reclamation project in consideration of \$26 per acre, payable in installments, a suit against the register and receiver of the Land Office, the engineer in charge of the work, and the United States fiscal agents appointed to collect the charge to restrain them from extending or collecting assessments in excess of \$26 per acre was, in fact, a suit to compel specific performance of a contract against the United States and unsustainable without the government's consent. *Plain v. Horne*. U. S. Circuit Court, District of Idaho. 196 Federal 582.

PRESCRIPTIVE RIGHT.

Where defendants' predecessors in title had acquired the right to obstruct the outlet of a lake by a prior appropriation, for the purpose of creating water power, but from 1892 to 1909, during which time

complainants and their predecessors acquired title to the land surrounding the lake, there had been no obstruction at the outlet, except for a short time in 1907, when complainants consented to a temporary interruption of the natural flow of the water at that point, defendants' right of re-entry was barred by adverse possession. *Thomas v. Spencer*. Supreme Court of Washington. 125 Pacific 361.

RESTRAINING STATE ENGINEER.

A petition for an injunction, the purpose of which is to restrain action by the state engineer and an applicant for water rights on a certain stream until a hydrographic survey could be made and the rights of all claimants determined, and which shows that petitioners had previous to the date of the filing of the application duly and lawfully appropriated to a beneficial use all of the waters of the said stream, but that no hydrographic survey nor judicial determination of their rights had ever been made, and which pleads that to allow the prayer of the applicant would be to destroy a long established irrigation system erected at a cost of \$50,000, and that the applicant was not in good faith seeking such water rights for the purpose of putting the water applied for to a beneficial use, but merely for speculative purposes, states a cause of action: nor is the said petition vulnerable to a charge of either misjoinder of parties or improper joinder of causes of action because there is joined therein all of the parties claiming a right in and to the water along with the state engineer, and the relief asked against the latter is different from that demanded against his codefendant, the purpose shown being to hold the entire matter in statu quo until a survey and adjudication could be made, as required by the statute. *Gay v. Hicks, et al.* Supreme Court of Oklahoma. 124 Pacific 1077.

(Continued from Page 43.)

and oats to the acre, and like yields of all other kinds of farm products. European countries are doing it. Why not America? They see a time when farmers and farmers' wives and their children will think more and work less. Every bushel raised means just that much profit, and the profits of the farm promote commerce and industry.

Were every acre of ground in America made to produce all that it is capable of producing, the wealth of America would be more than doubled. The United States government, the agricultural colleges, the railroads, the bankers, the grain men, the I. H. C. Service Bureau, the agricultural and country press, and other organizations have done much in education and farm development. But the Service Bureau and Professor Holden are now going forward with plans which seek to co-operate with all other plans, and at the same time they are pushing out along individual service lines all their own.

After a period of good work in Michigan Agricultural College, better work at Illinois, and great work at Iowa, Professor Holden now enters upon a world's work. While in future Professor Holden will designate Chicago as home, he says he is not leaving Iowa—he merely is carrying Iowa to the rest of the world.

Reclamation Notes

CALIFORNIA.

The surplus water from the Tuolumne river, which is allowed the Modesto irrigation district, and such as is not needed at this time, has been turned into the main reservoir in the upper part of the district. The main reservoir was completed a year ago, and was built for the purpose of saving water during the winter to be used in the summer when the river fails to fill the irrigating canals. By this method the period of irrigation has been lengthened to a considerable extent.

George Davis, who owns a ranch near Vacaville, has completed a five-foot concrete dam across Ulatis Creek, the object of which is to raise the water level for the purpose of sub-irrigation. A reservoir, having a capacity of 10,000 gallons, has also been constructed on the ranch.

T. K. Beard, of Modesto, has been awarded contract for the construction of a dam and outlet gate to impound water for late irrigation in the Morley lakes east of Hickman. The contract was awarded by the directors of the Turlock Irrigation District and calls for work to be completed by January 15, 1913. The contract price for the work is \$25,000.

The Sweetwater Company of San Diego county, has applied for permission to increase its rates for water. The application states that the company is now serving 4,047 acres of land with water. The company protests especially against its acre irrigation rate of a little over \$7 per acre for citrus orchard purposes. The company asks that this rate be raised to 7 cents per 1,000 gallons.

The water users of the Hickman ditch, east of Hughson, have perfected a local irrigation organization for the purpose of better taking up any grievance or question concerning the welfare of their district with the irrigation board.

The El Casco Land Company, composed of Redlands and Los Angeles men, which owns about 4,000 acres in the San Timoteo canyon, has started work on developing enough water on the ranch to place the entire acreage under cultivation. An old well, sunk to a depth of 60 feet, will be cleaned out and sunk until a heavy flow is procured. Other wells will be bored and it is believed enough water can be procured in this way to irrigate the entire ranch.

An irrigation system is to be installed on the Fresno State Normal grounds. A pumping plant, according to specifications received at the school recently, will be erected to the rear of the site of the main building of the school which will supply the necessary water for irrigation purposes. Bids are to be asked for in the near future for the installation of the proposed irrigation system. According to the present plans, pipes will be laid from the pump to different portions of the ground.

Articles of incorporation have been filed by the Yucalpa Triple Falls Mutual Water Company. The principal office of the company is located in Los

Angeles. W. M. Campbell, A. I. Newton, J. D. Carlisle, C. C. Brinkley and W. A. Geller are the incorporators.

Hugh Blair, a retired banker of Detroit, Mich., has purchased 4,000 acres north and east of Dinuba, and will subdivide the property, putting a well on each 20-acre tract. C. F. DeWitt Company, of Los Angeles, will handle the sale of the subdivision.

A. L. Cowell of Modesto, has been hired by the Modesto Irrigation District at a salary of \$300 per month to supervise legislation in the coming session of the Legislature, which pertains to irrigation.

Permission to issue bonds in the sum of \$10,000,000 was granted the Southern California Utilities Company by the railroad commission early this month. The issue is desired for the purpose of developing a land and irrigation system embracing 30,000 acres of land in Riverside county. The scheme provides for the purchase of the Ramona Power and Irrigation company for \$350,000, the Lake Hemet Water Company, the Fairview Land and Water Company, the Hemet Town Water Company, and the Hemet Land Company for \$1,417,992, and the construction and development of an irrigation system and power plant for \$4,117,000. It is understood that English capitalists have agreed to purchase the bonds.

A deal which involved \$1,500,000 as an initial expenditure for the land and will mean the reclamation of 60,000 acres of overflowed territory at the cost of \$4,000,000 was closed recently in Sacramento. The purchasers are Chicago capitalists, represented by R. J. Dunham and advised by W. E. Gerber, president of the California National Bank of Sacramento.

COLORADO.

Upon application of the City Trust Company of Chicago, and Harrison Riley, trustee, a receiver has been appointed for the Pueblo-Rocky Ford Irrigation Company. The petition states that the company, which has control of 20,000 acres of land in the Arkansas Valley, defaulted in the payment of interest on the loan of \$2,000,000 on July 1, 1912, and has not been able to pay. The petition for a receiver charges that the property has not been properly managed but does not accuse the officers of criminal wrongdoing. It is stated that unless the receiver takes hold further depreciation will follow.

Under the High Line canal tracts as small as twenty acres will be apportioned to homesteaders, according to statement of F. D. Pyle of the Reclamation Service, who has been at Grand Junction recently studying the soil under the project with a view to determining the unit of acreage for homestead purposes. Work on the canal has been commenced. The government has available for this project \$1,800,000 and this sum will put the tunnel a long way toward completion. According to Mr. Pyle, the unit of homesteads under the local project will not exceed forty acres, as an average. The position taken by the government is that the cost of the project is such that 160 acres would be too great a burden for the homesteader, while past experience in the valley has demonstrated that ten or even five acres are sufficient for the support of an ordinary

family, and there is no intention on the part of the government to permit any one to take up land for speculative purposes. Those people who originally filed on 160 acres of land under this project will be required by the government to deed back 120 acres for settlement by other persons. However, the original homesteaders will be given the opportunity to make choice of the land they desire to hold.

The Florida Mesa Land and Development Company, financed by eastern capital and represented in the state of Colorado by W. L. Rucker, a contracting banker of Denver, has taken over the holdings of the Pioneer Construction Company, the outstanding bonds alone amounting to \$403,000, which now stands as a lien against every farmer in that district, and they are offering to pay 50 cents on the dollar for the warrants issued by the Pioneer Company. The system as planned on the Florida mesa near Durango will be sufficient to provide water for 12,000 acres of land.

A splendid flow of artesian water has been encountered in the artesian well which the Morrissey brothers are drilling on their ranch near Florence. The new well is said to be discharging 3½ cubic feet of water per second, which is sufficient to irrigate 1,000 acres of land. Water was struck at a depth of 800 feet.

OREGON.

The Horse Fly irrigation district of Klamath county has voted to issue \$785,000 in bonds for construction of an irrigation project.

Construction work has been commenced on the dam for the Lamberson reservoir of the Bully Creek irrigation project, which is to water 40,000 acres of rich bench and valley land surrounding the city of Vale. Work has been started on the 400-foot tunnel which is to be located on the north side of the dam. The Lamberson reservoir will store 75,000 acre-feet of flood waters. It is understood that the project will be completed within two years. Over 15,000 of the 40,000 which are to be reclaimed are already contracted to be supplied with water at the rate of \$80 per acre.

Ninety days' extension of time has been granted the Central Oregon Irrigation Company on their contract with the state for the construction of the North Canal. The contract was to expire January 1, 1913, but the company asked for six months' extension. The Desert Land Board granted only ninety days.

County treasurer P. W. Halliday of Vale, has been elected president of the Nevada Ditch Association, which is composed of ranchers between Vale and Ontario. The Nevada irrigation ditch covers 6,000 acres of fine alfalfa land.

Good progress has been made on the reclamation work begun this fall. The work now in progress will carry water to approximately 6,000 acres. Most of this land is in the Poe Valley from 13 to 20 miles from Klamath Falls. A narrow strip of land along the east side of Stukel mountain will get water from the Griffith lateral, which latter is supplied with water from the large horseshoe dam on Lost river. All of the work will be completed early next fall.

Failing to reach a compromise in the Government suit against the water users of the Umatilla river and its tributaries, testimony will be taken in 300 cases. The government has held out for a half-inch per acre while the water users have asked for at least an inch. Neither side would yield, so it has been left to the court to settle the dispute. The litigation was started a year ago last May and has been postponed from time to time in order to test out the amount of water needed. The water users have conducted careful examinations during the past season to determine the amount of water needed, and claim that the nature of the soil requires more than a half inch, as claimed by the reclamation attorneys.

TEXAS.

Rather an important opinion was handed down recently in the Third Court of Civil Appeals at Austin, Texas, holding telegraph companies responsible for damages growing out of mistakes made in sending a telegram ordering irrigation machinery. H. C. Goldwire was irrigating 100 acres of land fifteen miles from San Angelo, using a gasoline engine for pumping the water. The engine exploded and he sent a telegram from San Angelo, ordering certain parts "rushed" in order to resume pumping. Among the parts ordered were "both sections of base." The telegraph company delivered the message as reading "both sections of hose." This resulted in delay and damage to his crops of corn, cane, alfalfa, potatoes, onions and melons.

The Altascosca Valley Irrigation Company, formed several months ago for the purpose of undertaking big development work in the neighborhood of Coughran, three miles east of Pleasanton, has begun active development. The project embraces 4,000 acres.

The dam of the Carrollton irrigation project was completed early last month. This project has been under construction for some time and cost over \$30,000. The basin is now ready for service and is built to impound 400,000,000 gallons of water. The main wall is 150 feet long and 20 feet high. The Elm Fork of Trinity river will afford water for the reservoir. The great dam for the Medina irrigation project, thirty miles west of San Antonio, has been completed after work of a year and a half. It is built of iron and concrete and cost \$7,000,000. Another million is being expended on lateral canals and siphons. The dam stands 165 feet high, is 1,500 feet across and contains nearly 300,000 cubic yards of concrete.

Z. E. Black, formerly secretary of the commercial club at Plainview, has been appointed publicity agent for the Pearson interests, which is developing 60,000 acres of land in the vicinity of Plainview. The tract will be fully developed and cut up into small farms before it is thrown open for settlement. A competent irrigation expert has been appointed to supervise the demonstration farm, comprising 400 acres, which has been installed by the company for the education and convenience of the settlers.

The sale of the assets of the Brownsville Irrigation Company to Frank T. Williford, Jr., of Houston, made on October 1st, has been confirmed by Judge Norman J. Kittrell of the Sixty-first District Court.

The sale was made for \$57,000, of which \$25,341.51 will be paid in cash, while the balance, \$31,658.49, is represented in two judgments that will be receipted and turned over to the receiver of the concern. The property of the Brownsville Irrigation Company consisted of 640 acres of land in right of way, forty-five miles of canal, pumping stations, machinery and other improvements. The land in question is located in Cameron county.

Cameron Farm Company of Orange, capital stock \$75,000, has been chartered by the Secretary of State. The purpose of the company is to grow and prepare rice for market, with power to maintain and operate irrigating systems. A. J. Bancroft, Geo. W. Bancroft and G. M. Sells, all of Orange, are the incorporators.

MISCELLANEOUS.

The Dempster Mill Mfg. Co., of Beatrice, Nebraska, has been awarded the contract for the installation of twelve large pumping plants, each having a capacity of over 1,500,000 gallons per day, by the Coldren Land Company of Kansas City, Mo. These plants are to be located each one on a quarter-section of land scattered about over a tract of 70,000 acres of shallow water land located in what is known as the Black Water valley of the Panhandle, Texas.

The Reclamation Service has awarded contract for the construction of 34 miles of Dodson South Canal near Malta, Montana, a part of the great Milk River irrigation project, to two builders as follows: Schedules 1, 2 and 3, involving a total of 897,000 cubic yards, awarded to Chas. Wilhite & Company of Boise, Idaho, for \$163,330. Schedule 4, for excavating 400,000 cubic yards to Winston Brothers & Co., of Minneapolis, Minnesota, for \$77,600, making a total of \$240,930 for the whole contract.

Frank Wildes of Carson City, Nevada, who owns several hundred acres of land near that city, is planning to irrigate same by means of a tunnel through the hill west of the Holbrook ranch.

The Department of Agriculture is taking steps to establish an experimental farm in the Hart river bottoms near the town of Mandan, North Dakota. The main farm and buildings will be located on 40 acres and though irrigation will be carried on on a small scale the equipment will be complete and modern in every respect. It is proposed to build a small pumping station on the land.

The Bitter Root Valley Irrigation Company of Hamilton, Montana, are asking for bids on 5.9 miles of canal, average bottom width eight feet, approximately 73,000 cubic yards, with possible extension of 2.4 miles, approximately 27,600 cubic yards, to be let as unclassified material. Test pits are dug. Work must be completed before next irrigation season. Contractors may secure particulars from the engineer's office, Hamilton, Montana.

The Egyptian government has begun one of the most costly and comprehensive drainage projects for the reclamation of lands ever attempted by any government in the world. Its object is to bring 1,000,000 acres of fertile land in the delta of lower Egypt under cultivation. It is estimated that the work will require four years and \$15,000,000 will be required for drainage and a like amount for irrigation.

(Continued on Page 53.)

Irrigation of Alfalfa

By SAMUEL FORTIER,

Chief of Irrigation Investigations, Office of Experiment Stations,
U. S. Department of Agriculture.

Seeding Alfalfa.

In the Yakima valley, March and April are preferred for seeding alfalfa, both on account of the climate and the abundant water supply of that period. The ground is plowed deep, graded, smoothed, and harrowed. From 10 to 20 pounds of seed are then put in with a broadcast seeder and harrowed lightly. The furrows are then marked off and irrigation begins. The ground is kept moist constantly until the young plants are fairly well established. The use of so much water at the start is due largely to the tendency of the soil to bake if allowed to become dry.

The alfalfa growers of Montana are about equally divided in opinion as to the advantages of using a nurse crop. Those who seed grain with alfalfa claim that they get more out of the land the first season, while those who are opposed to this practice believe that the injury done to the alfalfa plants by the grain crop extends through several years and that the small gain of the first year is more than offset by the lessened yields of alfalfa in subsequent years.

In northern Colorado, rotation of crops is practiced and alfalfa seed is sown with a nurse crop, usually wheat or barley. The seed is drilled early in the spring with a common force-feed press drill equipped with an auxiliary seed box for alfalfa seed, which is scattered broadcast between the grain rows and covered by the disk wheels of the press drill. From 12 to 20 pounds of alfalfa seed are sown. Irrigation before seeding is not practiced. There is, as a rule, sufficient rainfall to furnish both crops with moisture until the grain is ready to head out and the alfalfa is 4 to 6 inches high, when the field is irrigated.

At Wheatland, Wyo., various methods of seeding alfalfa are in use, but the one which gives the best results may be described as follows: Drill in 1 bushel of barley to the acre; then in a week or ten days cross drill the field, sowing 12 to 15 pounds of alfalfa, setting the press drill so that the seed will be covered 0.75 inch to 1.5 inches deep.

In Yuma and other valleys of Arizona, October planting is preferred. Frequently in this dry climate the land is irrigated before being seeded. It is cultivated, then seeded and harrowed. In the dry-planting method the seed is sown broadcast on the dry soil, harrowed lightly with a brush drag, and then irrigated. A second irrigation is necessary in about eight days to break the surface crust.

In California the treatment given to alfalfa in the first stage of its growth varies somewhat with the locality; in Kern county the seed is sown from December to April, inclusive, with a preference for February and March seeding. If the soil is dry it is first irrigated. In the Modesto and Turlock districts more or less seeding is done throughout the winter months, but the greater part is seeded in March and April, just before the dry season begins. From 30 to 40 acres can be seeded in a day with a hand-broadcasting machine if the operator sits in the back of a wagon which is driven over the field. Eighteen pounds of seed to the acre is the average amount sown.

Rise of Ground Water and Its Effects on Alfalfa.

In their natural state the typical soils of the arid region are characterized by the depth to water and their looseness and dryness. The diversion and use of large quantities of water in irrigation soon change some of these natural conditions. A part of the flow in earthen channels escapes by seepage and still larger quantities percolate into the subsoil from heavy surface irrigations. The waste water from these and other sources collects in time at the lower levels and raises the ground-water level. This rise is usually noticed first in wells, a permanent rise of 5 feet in a year being not uncommon.

This rise of the ground water is an advantage, provided the water table does not rise too high. It lessens

greatly the cost of sinking wells, less water is needed in irrigation, and it furnishes a reservoir from which water can be pumped to supply other lands.

It is not until the water level encroaches upon the feeding zone of valuable plants that its injurious effects are felt by the farmer. Its near approach to the surface may prove so disastrous that its upward trend should be noted with the greatest care. Perhaps the best means of providing for such observations is the use of test wells.

There is some difference of opinion as to what depth below the surface marks the danger line for alfalfa. It has been shown by Doctor Loughridge, of the University of California, and by other soil physicists that water may be withdrawn by capillarity from soils to depths varying from 4 to nearly 5 feet, depending on the character of the soil. This fact has an important bearing on the subject, because when the ground water is brought to the surface and evaporated the salts held in solution are deposited at or near the surface. If these salts contain much sodium sulphate, or even sodium chlorid, all of which are usually grouped under the common term alkali, the crust formed by them will in time destroy the alfalfa. It may be stated, therefore, that when alkali is present in harmful quantities in the ground water it should not be allowed to rise nearer than 4 feet below the surface.

The percentage of harmful salts in the ground water is usually determined by the chemist of the nearest agricultural experiment station, but when an accurate test cannot be made in the laboratory the farmer may make a practical test in the following manner, in accordance with a suggestion made by A. T. Sweet, of the Bureau of Soils of this department:

Take three pots containing equal amounts of soil and plant the same number of grains of wheat in each. Water each pot with equal quantities of water. In No. 1 apply fresh water, in No. 3 ground water, and in No. 2 an equal amount of each kind. The injury, if any, caused by the ground water will be indicated by the longer time required for the plants to appear above the surface, the smaller number of plants to germinate, and their general appearance.

In soils free from alkali but saturated with water there is not the same necessity for holding the ground water continuously below a so-called danger line. In parts of Kern county, Cal., the ground water sinks to 8 feet below the surface of alfalfa fields in summer, but rises to within 1.5 feet of the surface in winter. There is no indication of root rot and the plants have retained their full vigor. Numerous cases might be cited to show that the rise of water to within a foot or two of the surface for comparatively short periods of time does little injury to the plants. On the other hand, wherever water stands continuously during the irrigation season within a few feet of the surface it is pretty certain to kill alfalfa in three years or less.

The Injurious Effect of Silt on Alfalfa and the Benefits to be Derived From Disking.

The silt-laden waters of the rivers of the Southwest during periods of high water in time form a crust over the surface of irrigated alfalfa fields. The soil formed by such rivers is naturally impervious, and when a coating of fine sediment is deposited around the plants the effect is injurious, particularly to young plants, which may be killed as a result, notwithstanding the fertilizing value of the silt. In irrigating with water carrying much silt the larger and heavier particles are deposited in the channels which convey the water from the streams, while the finer and lighter particles are carried to the fields. These fine particles cement together and form so hard a crust when dry as to exclude both air and moisture from the soil.

Engineers may in time devise a practical remedy for this evil by building settling basins and storage reservoirs, but at present the tendency of many officers of canal companies is to increase the grade of the channels so as to carry the greater part of the silt to the fields. This does not solve the problem; it merely shifts the burden to the water users. To such, disking the surface at the proper time has proved the most efficient remedy. An effort is made to secure well water or clear ditch water while the alfalfa is young and later to counteract the bad effects of muddy water by the free use of the disk.

(Continued from Page 51.)

tion. Ninety per cent of the land to be reclaimed is owned by the government.

A private irrigation system in northern Washoe county, Nevada, which is owned largely by Capt. E. W. Johnston of Seattle, Washington, is being rapidly brought to completion. A tunnel has been run 1,300 feet to tap Massacre, Middle and Western lakes, which will be drawn into a reservoir containing 200,000 acre feet. Captain Johnston expects to reclaim 125,000 acres of land. The estimated cost of the project is \$200,000.

The State Engineer's department of South Dakota has granted a permit to John A. Brown of Westover, S. D., to take water from White river for the irrigation of 600 acres on that stream.

State Engineer Trench of New Mexico has under consideration the granting of a water franchise to a Denver firm for 145,000 acre feet of the water of the Canadian river. The company has made several surveys of the dam site, laterals and grades, and it is stated that if the right is granted work on the construction of the main canal will be commenced not later than January, 1913. This will, if consummated, bring under irrigation some of the richest land in Quay county. Engineers of the company are now making final surveys and estimates.

An experiment in practical irrigation in a tract of land near Wichita, Kansas, is to be undertaken next year by several men of that section. A tract of land of suitable size to make a fair experiment will be procured and a small pumping plant in-

stalled. John Ferriter, C. I. Reed and other prominent men of Wichita are back of the scheme. These gentlemen have made a special study of irrigation and while the land in that vicinity is producing good crops it is their belief that with irrigation the land can be made to produce from fifty to one hundred per cent more than it now produces. The experiment will be watched with interest by farmers in that section.

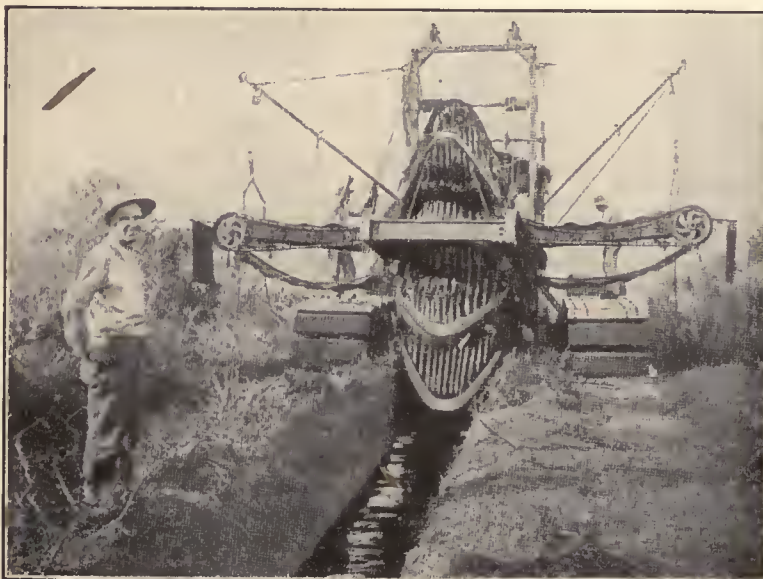
For the purpose of irrigating lands in the west, the Montana Water Power Company of Trenton, New Jersey, has filed articles of incorporation. The capital stock of the company is \$3,500,000, and the incorporators are Henry F. Kroyer, New York City; Geo. H. Burt, Roselle, New Jersey, and C. Norman Foy of Chicago, Ill.

O. L. Wilson, manager of the French Creek Irrigation and Development Company, has filed bond and contract with the State Land Board at Cheyenne, Wyoming, to commence work on the 15th of April, 1913. This company has a large project and Mr. Wilson states that there were ready to start work this fall but that, in view of the fact that it has gotten so late that will put the matter off until spring.

Dr. J. B. Perrin, of Williams, Ariz., and Dr. Milton McWhorten, of Oakland, Cal., are planning the construction of a large irrigation district to serve 10,000 acres of land which they own, situated west of Tucson.

Representatives of Colorado capitalists who are planning an immense reclamation project in San Juan county, Utah, waited upon the state land board

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early this month and submitted their plans. The storage reservoir of the project will be built across the Colorado line, but the land to be redeemed, amounting to nearly 100,000 acres, lies entirely in San Juan county, Utah. As the project is to be undertaken under the Carey Act the state land board must pass on it before work can proceed.

The Secretary of the Interior has granted the application of the Rio Virgin Fruit Lands Company for an irrigation canal and reservoir site in Washington county. The project when completed will reclaim several thousand acres of arid land in south Utah and northern Arizona.

Articles of incorporation have been filed by the West Bench Irrigation Company of Duchesne, Utah, capital stock \$2,700, in shares of \$1 each.

The citizens of Yuma, Arizona, celebrated the completion of the Yuma siphon early this month. The Yuma siphon is a concrete tunnel fourteen feet in diameter and nearly 1,000 feet in length. It is forty feet below the bed of the Colorado river and over one year was required for its construction. The irrigation water direct from Laguna dam reaches the siphon by means of a mammoth canal, falls down the shaft of the intake on the California bank of the Colorado river and rushing through the tunnel, bubbles up through the shaft of the outlet on the Arizona bank and on to its work of reclamation in the valley below.

L. R. Moore of Kansas City, Mo., has recently purchased 990 acres of land near Garden City, Kan., and same will be put under cultivation at once. The purchase price of the property was approximately \$50,000. Pumping plants will be established on the land, a large part of which will be sowed to alfalfa. Sweet clover will also be planted on the land, 80 bushels of seed have been purchased by Mr. Moore.

Articles of incorporation have been filed by the Belknap Canal and Irrigation Company of Chinook. The new firm will deal in real estate and will also construct flumes and open canals for the purpose of affording better water accommodations to the country in the vicinity of Chinook. The company is capitalized at \$20,000, divided into 10,000 shares at \$2 per share. L. V. Bogy, C. R. Reser, J. E. Paxton, Henry Kremer and Wm. Skeller, all of Chinook, are directors of the company.

P. J. Morgan of Salt Lake City, has filed suit in the United States district court asking for judgment of \$83,807.24, with legal interest from May 9 of this year, against the Pacific Reclamation Company, in payment for the construction of the Bishop Creek dam, located twelve miles north of Elko, Nevada. The complaint alleges that the above sum was the contract price for the dam to be payable on completion of the work. It is further alleged that the work was finished on May 12 and that the reclamation contract has shown no inclination to settle.

An application filed with the state board of irrigation by the Frenchman Valley Irrigation Company of Culbertson, Nebraska, asks for the right to construct a reservoir near Waunete with 15,000 acre feet capacity and to take water from the river for storage there. It is estimated that the project will cost \$70,000.

A SOIL CONDITION.

Soil conditions are the prime requisites to successful agriculture, and the proper conditions are not all the same for all kinds of crops. A soil particularly adapted to one kind of crop may be wholly inadequate for others. The soil in proper condition for whatever crop to be grown must contain the absolutely necessary ingredient, moisture.

The moisture of the soil which is available for plant growth is known as free moisture, or that which is apparent. This moisture or water dissolves the salts of the soil and is taken into the plant roots to be used in the growth of the plant. This moisture is absorbed from the soil and by the capillary action follows along the minute tube that extends up the stem of the plant and out to the leaves where the moisture is evaporated. This process is continuous and at the same time the growth of the plant is increased. We see that there must be some ratio between the amount of moisture absorbed by the plant and the increased growth produced.

Many experiments have been made upon different kinds of farm crops and the amount of water required to produce a pound of dry matter varies between wide limits. These tests indicate that 200 pounds of water will be necessary to produce a pound of dry matter, while in other cases as high as 800 or 900 pounds will be necessary.

This great variation is due to the climatic conditions, locality, kind of crop, and kind of soil. In the humid regions less water is required than in the arid country, and this fact partly explains why a greater amount of water must be held in the soil in our irrigated districts of the west. Wheat, in all probability, will require less water per pound of dry matter than oats, and alfalfa will require more than oats.

If we assume that an average crop requires 400 pounds of water to produce one pound of dry matter and in the case of alfalfa, which produced 4 tons per acre for the season, will require for the above average about 51,200 cubic feet of water, or a depth of a little over 14 inches over the entire acre, or 1.175 acre feet. This amount of water must be held in the soil particles as free water available for the plant growth. A good soil must be of such a nature as to act as a reservoir and at the same time supply the necessary chemical constituents to the plant.—R. L. Parshall, Colorado Agricultural College, Fort Collins.

(Continued from Page 47.)

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(Continued from Page 42.)

"If the water is so valuable, why is it that so little attention is paid to its measurement and distribution? When a piece of land changes hands, the buyer never thinks of accepting it without first having it carefully surveyed and an abstract made of it, yet he is willing to accept the water for that land just as it comes, or just as the water master, if there be one, sees fit to give it to him. Many times he is not satisfied, and still he takes no steps toward the correction of this condition."

In conclusion, the following statement is submitted concerning the ultimate effect of careful water measurement in irrigation operations.

1. The percentage of water logged land in irrigation areas will be largely reduced.
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4. Present irrigable areas will be increased.

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In leaving spraying pumps for the winter, see in the first place that they are stored under cover where they will be kept dry. Clean them thoroughly, taking particular pains to drain out any water which may remain in the pumps and from the jacket of the gasoline engine if power pump is used, bearing in mind that a valuable engine can be practically ruined by water being left in the water jacket and freezing. A liberal application of engine oil to all the working parts of the engine in the fall will do much to keep off rust. Nozzles and hose should be cleaned out and dried. Any wooden barrels or tanks used as reservoirs should be put away from the sun, preferably in a moist place.

If any insecticides are left over, put them on a shelf out of the way, properly labeled. Remember that paris green deteriorates by being kept in the open air. Arsenate of lead which one desires to keep for the following year should have a good covering of water to prevent its drying.

F. L. WASHBURN,

Division of Entomology, Minnesota Experiment Station.

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How to Drain Farm Lands.

In addition to other necessary elements, soil must contain a certain percentage of water in order to yield the largest possible returns. A perfectly dry soil is dead, and worthless for producing crops. On the other hand, a soil completely saturated with water will produce nothing but aquatic plants, and hence is worthless for cereals and other valuable products.

Surface drainage is accomplished by open ditches, which in addition to receiving and removing water from the surface of land contiguous to them, may, if sufficiently deep, act as receiving drains for water which percolates through a porous substratum through which the ditches are excavated, and under such conditions facilitate underdrainage as well as carry off water from the surface.

Underdrainage is that which directly affects the soil and puts it in condition for plant production. The use of drain tiles for this purpose, introduced in England about the year 1810, has increased to such an extent, and the art of using them has been so perfected, that the tile drain is now regarded as the best type of underdrain. Well burned clay pipes of circular form, 1 to 2

feet long, are laid through the soil in a continuous line upon such a grade that any water which finds its way into them will be carried by gravity to some lower point, thus conveying the surplus away. The water enters the lines of tile through openings left between the ends of the "joints," as they are commonly called.

The drain being surrounded by soil, the spaces of which are filled with water, the water in the soil flows by gravity through the crevices between the ends of the tiles, thus entering the drain, and passes off more or less rapidly, according to the grade upon which the line is laid. The process does not leave the soil without moisture, but only removes the surplus, leaving just enough moisture to keep the soil in a fertile condition.

In order to get the best results in a system of drainage, the work should be laid out with a leveling instrument. No one can be relied upon to guess a grade correctly, nor can any one arrange a system of grades with economy, and at the same time get the best possible work out of the system, without first knowing the facts as determined by a dependable leveling instrument. The slight grades upon which lines of tiles may be laid with

satisfactory results are a surprise to many; indeed they were regarded as entirely impracticable until the experience of recent years proved the contrary. Lines of drain tiles laid on a grade as low as one-half an inch per 100 feet in firm soil will operate successfully, providing the lines are not too long, while drains laid on grades of 1 to 2 inches per 100 feet may be counted by the hundreds of miles and their successful operation is attested by thousands of acres of cultivated lands. It is not difficult to impress upon the mind of any one who will give the matter attention the fact that such work must be laid out with accuracy, and this can not be done without the aid of a dependable telescope farm level.

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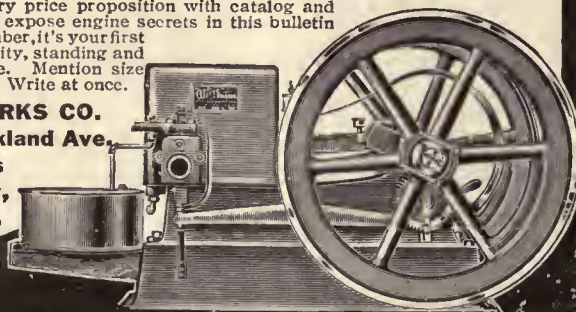
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has been on the market nearly 30 years and the sales get bigger every year.

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Price \$15

which has Telescope enabling you to read the Target over 400 yards away, is the most simple, accurate, durable and complete outfit ever made for

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Many of the largest hardware dealers from the Atlantic to the Pacific now carry it in stock.

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Send \$1.00 for The Irrigation Age, one year, and the Primer of Irrigation, a 260-page finely illustrated work for beginners in irrigation.

UNDERGROUND WATERS A VITAL NECESSITY.

The importance of underground waters to residents in humid sections is illustrated by the fact that 75 per cent of the population in Michigan are directly dependent for water upon the underground supply. Another investigation of 19 counties in north-central Indiana indicates the vital relation that ground water bears to daily life. Of 54 communities in these 19 counties having public supplies, 45 use wells alone and 3 others use both streams and wells. The urban population is therefore largely dependent upon the subsurface supplies, and the rural population depends almost entirely upon them. It is estimated that in Florida 750,000,000 gallons of ground waters are used daily for town and country domestic supplies, while an additional 11,500,000 gallons are used by the cities and 500,000,000 gallons for the irrigation of tobacco, citrus fruits, and vegetables. One-half of the irrigation and the greater part of the city supplies in southern California, amounting to more than 300,000,000 gallons daily, are drawn from the sands and gravels that underlie the valleys, while in central California a smaller but nevertheless important draft is made upon the same source. It is probable that it would be safe to apply percentages but slightly less than that determined in the state of Michigan to the entire United States, and to state that nearly 75 per cent of our population depends directly upon underground waters.

[From Water-Supply Paper 234, United States Geological Survey.]

20 Reasons Why You Should Investigate the **SANDOW** Kerosene Stationary ENGINE

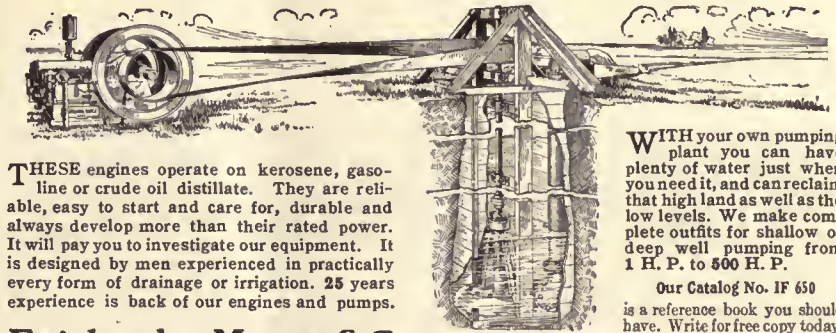


It runs on kerosene (coal oil), gasoline, alcohol or distillate without change of equipment—starts without cranking—runs in either direction—throttle governed—hopper cooled—speed controlled while running—no cam—no valves—no gears—no sprockets—only three moving parts—portable—light weight—great power—starts easily at 40 degrees below zero—complete, ready to run—children operate them—5-year iron-clad guarantee—15-day money-back trial. Sizes 2 to 20 H. P. Send a postal today for free catalog, which shows how Sandow will be useful to you. Our special advertising proposition saves you one-half cost of first engine sold in your county. (167)

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1,000 to 3,000,000 gallons per hour can be handled successfully by
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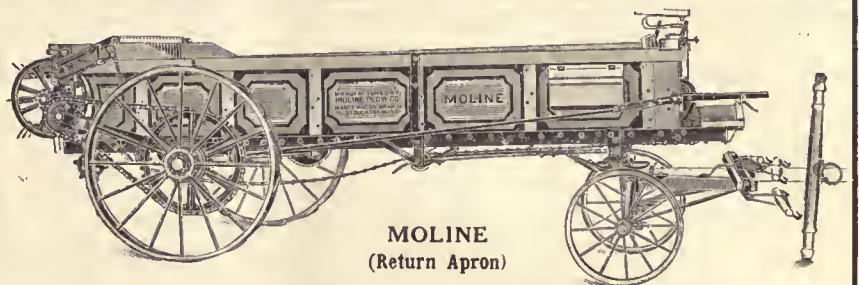


THESE engines operate on kerosene, gasoline or crude oil distillate. They are reliable, easy to start and care for, durable and always develop more than their rated power. It will pay you to investigate our equipment. It is designed by men experienced in practically every form of drainage or irrigation. 25 years experience is back of our engines and pumps.

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Save the Price of a Horse

Buy one of these Light Draft, Low Down Spreaders and do with three horses the same work which requires four with an ordinary Spreader.

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Easy to load—only 42 in. to top of Box at rear wheel.

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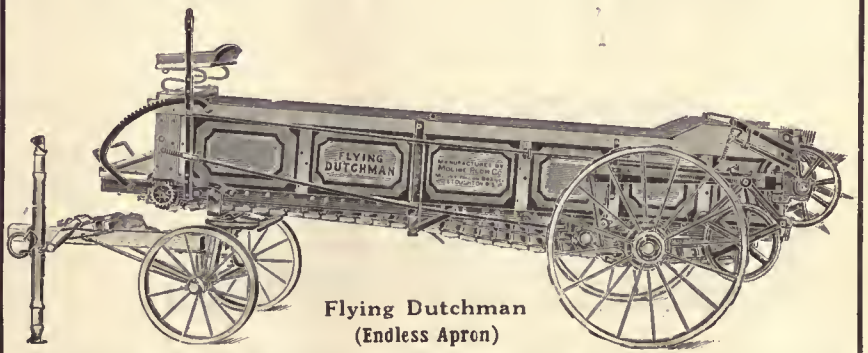
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We furnish all equipment necessary for up-to-date pumping plants.
Engines from 2 to 50 horse power. Pumps, all types and sizes.

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These boots give perfect foot-protection, which means good health, no matter how wet your work is.

They are made of the finest materials obtainable—reinforced at every wearing point—they are strong, long-wearing and easy-fitting.

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Reduced steamship passage one way or return. For particulars call or write Mr. F. T. A. FRICKE, Government Representative from Victoria, care of Peck-Judah Co., 687 Market St., San Francisco.

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Amazing "DETROIT" Kerosene Engine shipped on 15 days' FREE Trial, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing. No waste, no evaporation, no explosion from coal oil.

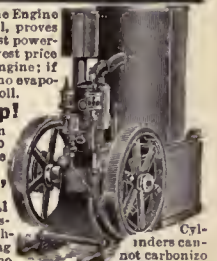
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Gasoline is 9c to 15c higher than coal oil. Still going up. Two pints of coal oil do work of three pints gasoline.

Amazing "DETROIT"

—only engine running on coal oil successfully, uses alcohol, gasoline and benzine, too. Starts without cranking. Only three moving parts—no cams—no sprockets—no gears—no valves—the utmost in simplicity, power and strength. Mounted on skids. All sizes, 2 to 20 h. p., in stock ready to ship. Engine tested before crating. Comes all ready to run. Pumps, saws, threshers, churns, separates, milks, grinds feed, shells corn, runs home electric lighting plant. Prices (stripped), \$29.50 up. Sent any place on 15 days' Free Trial. Don't buy an engine till you investigate the money-saving, power-saving "DETROIT." Thousands in use. Costs only postal to find out. If you are first in your neighborhood to write, you get Special Extra-Low Introductory price. Write! (158)

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(Newcomb Patent)

Made entirely of rust-proof, galvanized iron. No bolts or rivets used in construction. This flume is considered by experts to be the most serviceable equipment for the purpose on the market. A careful examination of the construction as shown herewith will convince those who are acquainted with irrigation conditions of its lasting quality and the ease with which it may be put together. Complete information, with prices, will be furnished on application to the



Section of Flume

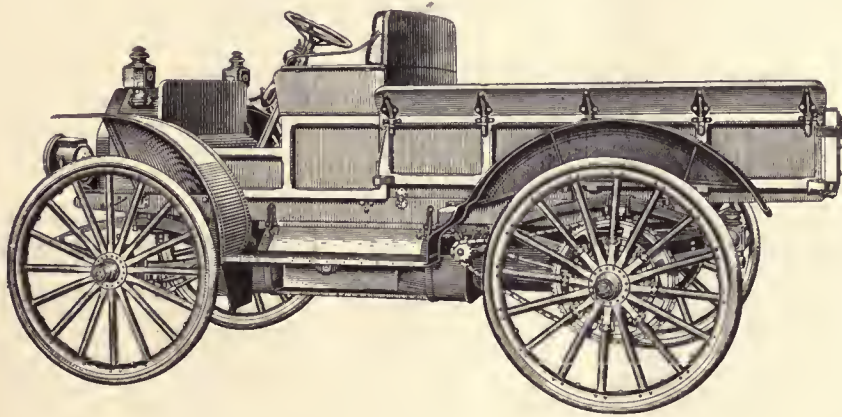
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International Commercial Car



THE INTERNATIONAL COMMERCIAL CAR was designed and is being built by men of ripe experience in the commercial car field. All delivery conditions were carefully considered by the designers, and the result is a car that is giving satisfactory service for light delivery purposes in all lines of business, and under all weather and road conditions. The International Commercial Car has a simple type of 2-cylinder 4-cycle motor, which develops sufficient power to carry the car loaded to its capacity up steep hills and over the worst roads.



The oiling is positive through a force feed mechanical oiler.

The transmission is a device of special merit. There are three speeds—two forward and one reverse. On high speed, the drive is direct from the motor. This transmission is equipped with a device that eliminates the danger of the driver placing two sets of

gears in mesh at the same time. The clutch is of the band type. It can be adjusted with absolute precision and is very convenient to reach whenever necessary.

The drive is by chains from the jack shaft to the two rear wheels—noiseless roller chains being used. The chain-drive transmits more power with less weight than any other form of drive.

The regular body is of a panel type, exceptionally well made. It is 67 inches long, 35 inches wide, and 9 inches deep—not including the flare boards which may be removed when not needed. The box ironing and braeing is all on the outside, leaving the inside of the box perfectly smooth. An extension sill and brace makes a very strong construction at the rear of the box. Solid rubber tires eliminate all pneumatic tire troubles and delays caused thereby. Efficient brakes are a necessity. The International Commercial car is equipped with brakes that make the control positive—an external band on the jack shaft and an internal expansion brake in both rear wheels.

A careful inspection of the International Commercial Car will convince any business man where quick deliveries are to be made, where there is a large amount of light hauling to do, and where there is a wide extent of territory to cover, it will prove indispensable.

Invest a letter or postcard in this business-building car.

WRITE FOR CATALOGUE AND FULL INFORMATION

International Harvester Company of America
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California Stream Diverted for Power, Irrigation, and Municipal Water Supply.

Power can be developed upon many surface streams and applied to the recovery of the water of the streams after it has sunk into the earth in the lower lands of the

valleys. An instance of this character according to the United States Geological Survey is to be found along Santa Ana River in southern California. A part of the water of this river is stored in a reservoir in the San Bernardino Mountains and the flow of the stream is thereby regulated. After it escapes from the reservoir it is diverted through a power plant and electric power is generated.



The Brevoort

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DOES IT INTEREST YOU? If so, send for our SPECIAL FREE CIRCULAR, showing SAND PROOF STEAM. IRRIGATING AND DRAINAGE PUMP. No Engine required with this pump

Sand on either outside or in cannot injure them. Will raise and force water, sand and gravel any distance required.

Saves fifty per cent of fuel.

Most economical irrigating and drainage pump to both install and operate now on the market. Will work submerged if required.

Has given 16 years of satisfaction to the largest concerns in America.

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Eliminate the Possibility of Failure

YOUR crops may fail—if rain does not fall at the right time, if needed moisture is withheld by the water company restrictions, or if your irrigating plant is unreliable. At one stroke you can eliminate all these chances or possibilities of failure—you can practically assure success—by installing an independent pumping plant operated by a dependable

I H C Oil and Gas Engine

I H C engines are so thoroughly well made and so thoroughly tested before they leave the factory that all chances of their ever being unsatisfactory are entirely done away with. In case of accident the I H C local dealer is at your elbow with efficient practical assistance. An I H C outfit is the most reliable and in the long run the most inexpensive outfit you can buy, because of the care put into its construction and testing and the service given you by the I H C local dealer.

No matter what your needs in an engine for irrigating and general work around the farm, you will find some engine in the I H C line meets them. There are horizontal and vertical engines, air and water-cooled, stationary, portable, or mounted on skids, built to operate on gas, gasoline, kerosene, distillate, or alcohol. Sizes 1 to 50-horsepower. Kerosene-gasoline tractors in all styles from 12 to 45-horse power. Sawing, pumping, spraying, grinding outfits, etc.

See the I H C local dealer and get catalogues and information from him, or drop a line to the nearest branch house.

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INTERNATIONAL HARVESTER COMPANY OF AMERICA
(Incorporated) U S A
Chicago

I H C Service Bureau

The purpose of this Bureau is to furnish, free of charge to all, the best information obtainable on better farming. If you have any worthy questions concerning soils, crops, land drainage, irrigation, fertilizer, etc., make your inquiries specific and send them to I H C Service Bureau, Harvester Building, Chicago, U S A



Below this power plant it is re-diverted and passed through a second power plant. Below this it is all distributed and used for municipal purposes and irrigation about Redlands and Highlands. The waters that return from the irrigation are recovered in springs and flowing wells and by pumping plants, a portion of the power developed higher up on the stream being used for the pumping. This recovered water is used for irrigation about San Bernardino and Riverside. A part of it reappears in the river above Riverside Narrows, where it is again taken out into a power ditch whose waters are returned to the river above Corona. A few miles below it is picked up by canals and distributed to the orange and deciduous groves about Anaheim and Santa Ana. The portion of it that returns there, by irrigation, to the ground water is once more recovered by the many pumping plants and flowing wells west of Santa Ana.

RIFE RAMS

give all the water needed for irrigation without pumping expense or bothering with an engine. Cost little to install—nothing to operate. Raise water 30 ft. for every foot of fall. Land lying above ditches watered at little or no expense. Pumps automatically day and night, winter and summer. Fully guaranteed.

If there is a stream, pond or spring within a mile, write for plans, book and trial offer FREE.



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Write For It Today

This book contains practical talks on the care, adjustment and use of modern farm implements. Every farmer should get this book and keep it.

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Get Quality and service—John Deere Dealers Give Both.

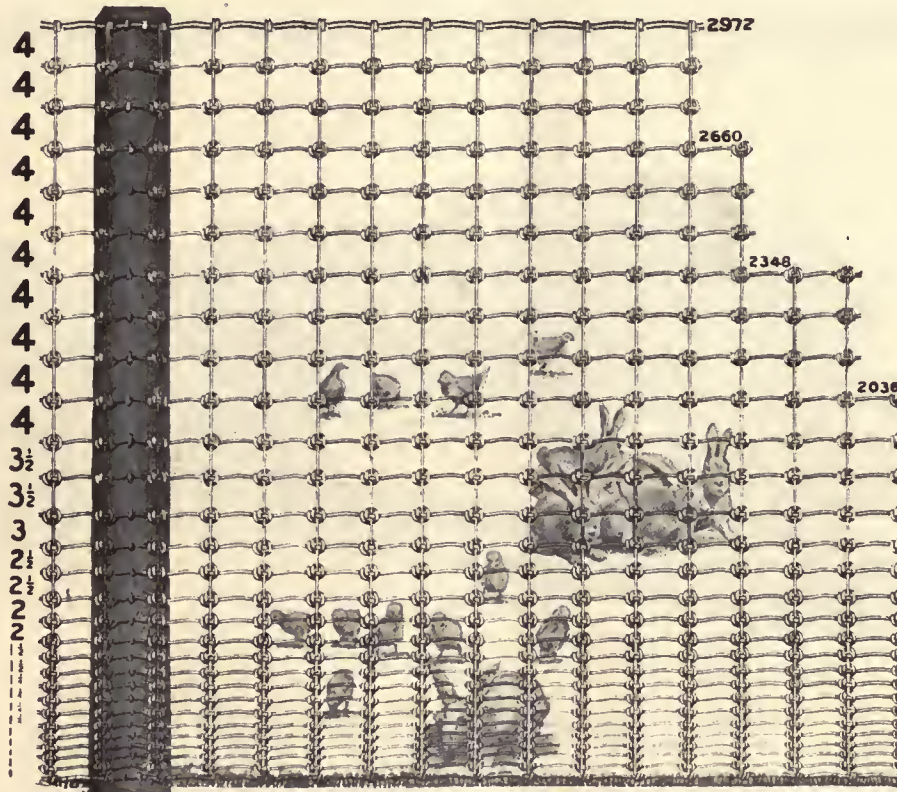
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RABBIT AND POULTRY FENCES



Stop your losses of valuable trees by girdling of rabbits. Chances are you can save enough trees to pay for your fence the very first season.

There is no fence like the PEERLESS to head off the "Jack" as it is close spaced all the way up—can't get through even when deep snow is on the ground, lifting him up two or three feet.

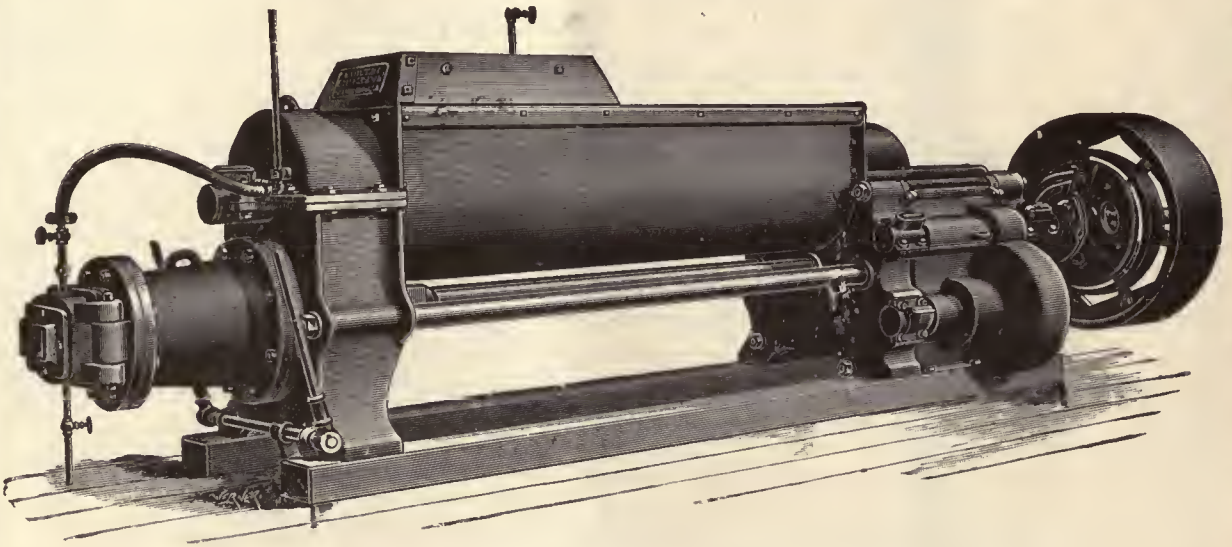
QUALITY Made of the very best quality of open hearth steel wire, coiled to provide for expansion and contraction due to changes in temperature. The stiff, one-piece crossbar is fastened to the line wires with the famous PEERLESS non-slip knot, making a more rigid fabric than can be secured by any other style of construction. Stretches just like a field fence, straight and true—no "pockets" or "sags."

MAKE-UP Four styles, as shown by illustration, 36, 48, 60 and 72 inches high. No. 11 wire top; No. 12 bottom; No. 16 filling; crossbars four inches apart. Five one-inch spaces between line wires at bottom—close spaced all the way up. Heavier, more efficient and longer lived than the old style netting.

The styles shown above are the best Rabbit and Poultry fences made by any company, and we make many other styles adapted to various purposes. Send for our complete catalog and price list.

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FIVE SIZES ALL CAPACITIES

Outfits for Drain Tile, Hollow Ware, Building
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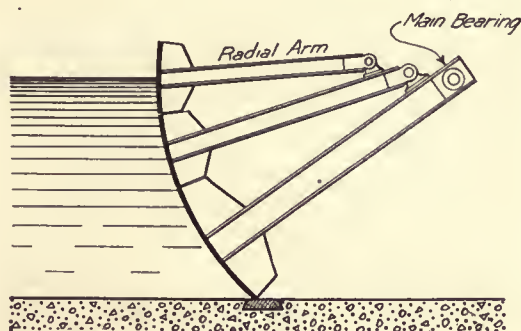
If interested write us for particulars and estimates.

E. M. FREESE & CO.

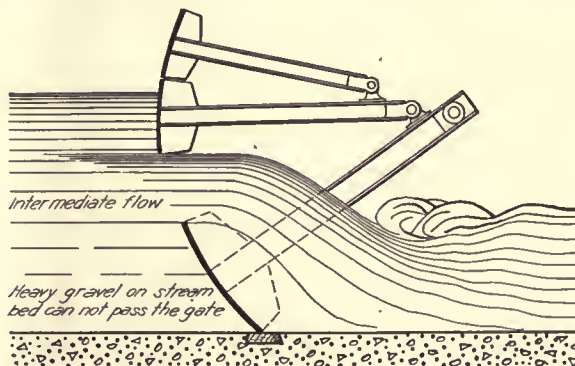
GALION, OHIO

THE HALL SEGMENTAL RADIAL GATE

For securing three-part control of water flow



GATE CLOSED

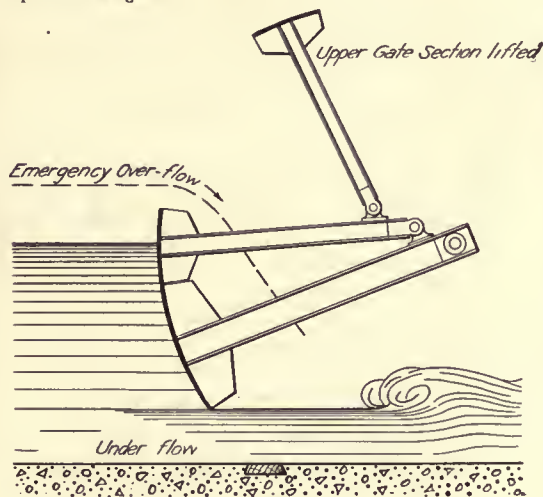


GATE RAISED FOR INTER-MEDIATE FLOW
(Head-gate example)

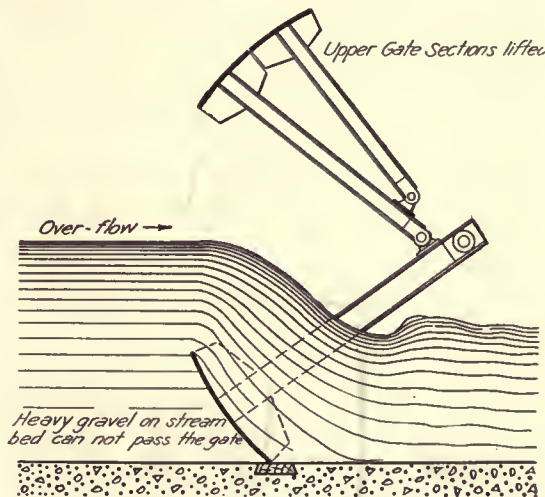
Our Circular describing the Hall Segmental Gate, which we will send on application, gives a clear understanding of this most admirable and practical device. For the first time the constantly recurring problem of the absolute control of diversion dams, main canals and lateral ditches is clearly solved. You will catch the basis idea instantly from the subjoined skeleton diagrams.

We call this "three-part regulation" because the problem always is to control surface flow (for trash) underflow (for silt and sand), simultaneously and yet independently, and at the same time maintain the upper lip in the proper position for safety spill, so that the canal may never be over-charged and a wash-out result.

Again, a diversion dam in connection with the canal head gates must always be able to reject the floating trash and sand at the intake and discharge them through the dam. Moreover, the pond above the diversion dam must neither be allowed to fill up, nor must the water level be lowered below the service point. Yet it must at the same time be controlled against sudden rises which would over-top the head gates.



GATE RAISED FOR UNDER-FLOW
(Waste-gate example)



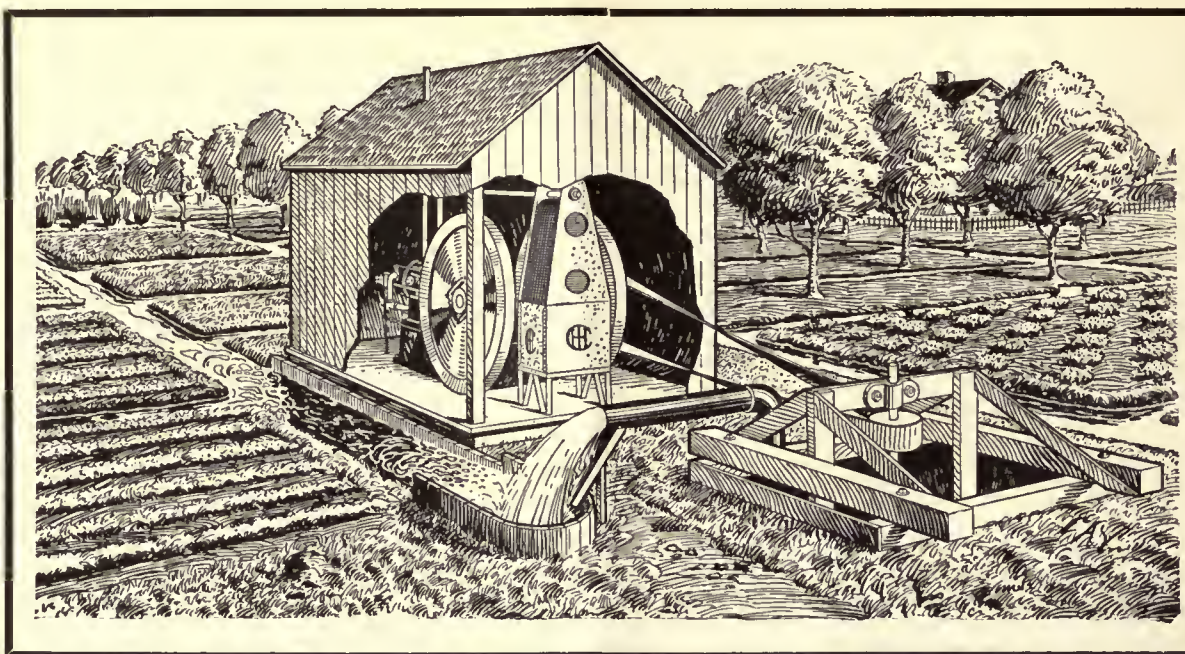
GATE RAISED FOR OVER-FLOW
(Head-gate example)

This is a complex proposition and varies with every stage of flood. By the Hall Gate it is absolutely under control, no matter what the combination. The gates themselves scarcely cost more than the ordinary "Tainter" or "Drum" gate and are operated far more easily.

The same type of gate is equally applicable to control a reservoir level on the crest of a spillway. The various figures herein shown are to a certain extent self-explanatory—the Circular will be wholly so. Send for it. Respectfully submitted,

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Is There Water Near or Under Your Land?

If so, the best way to raise it and distribute it on your land, where it will provide needed moisture for your crops, is to install a pump of sufficient size, run by a dependable I H C gasoline engine. The added profit on one crop grown with a plentiful water supply, instead of uncertain or insufficient rainfall, will often pay for the entire outfit. The essential features of a pumping outfit are dependability, durability and economy—positive assurance that you can have plenty of water when you need it for many years to come and at the lowest possible cost. The one best way to insure this is to install an

I H C OIL AND GAS ENGINE

which is dependable because correctly built, durable because made of the finest material, and economical both to maintain and run. Useful for all kinds of farm work, an I H C engine will run any machine on the farm up to the limit of its power. I H C engines offer a wide range of choice in style and size to the wise buyer—1 to 50-horse power, horizontal and vertical, air-cooled and water-cooled; stationary, portable and mounted on skids; built to operate on gasoline, kerosene, naphtha, distillate or alcohol; tractors in three styles, from 12 to 60-horse power. The traction engine is particularly valuable for use on large irrigated tracts. Besides being a good pumping engine it can be used for plowing, disking, harrowing, seeding, harvesting, threshing, hauling and for all kinds of belt-power and draw-bar work. An I H C tractor is far more economical than the horses required to do the same amount of work. The I H C line includes sawing, grinding and spraying outfits in various sizes.

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CHICAGO (Incorporated) **U S A**

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The blade of the Rural has the proper adjustment for making V Bottom Irrigation Ditches on a slope of one and one-half to one. Any elevation can be given the blade that the banks will stand. Rear end of blade raises 24 inches. Changing single-tree holes in the eveners, which places the rear horse in the ditch, is the only change needed in the Rural to adapt it to V bottom ditch work. The wheels being wide apart, which best holds a grader to its work, and lets one wheel travel in the point of the ditch and the other completely outside of the bank of earth thrown up, leaving the slope smooth and undisturbed.

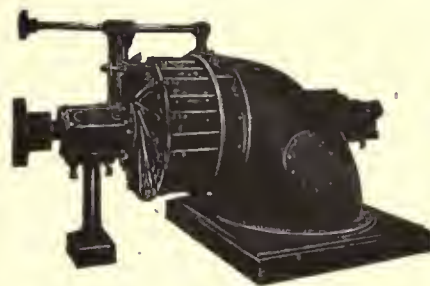


Making a V Bottom Irrigation Ditch Two Feet Deep on a Slope of One and One-Half to One. Two or Four Horses are Used, According to Requirements.

The Rural Grader is not tipped to any extent, owing to the wheels being wide apart and the axle having been made lower on the right hand side to equalize up on ditch work. In a grader with the wheels close together, one, and perhaps both, of the wheels must travel on the slope of the ditch, destroying the bank and tipping both machine and operator to a dangerous angle. Unequaled for cleaning out all deposits of silt, grass, etc., from irrigation ditches, whether dry or under water, anywhere teams can be made to travel. For the Irrigation Farmer, the Rural Grader and Ditcher is not equalled by any other machine if he wants one for business and the greatest value for his money. Any One with considerable level land can use one with much profit for opening up ditches through fields, which it will do, even when the lands are under water. To make larger and more permanent ditches and also to build and repair roads that the farmer is interested in.

C. D. EDWARDS, Albert Lea, Minn.

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When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

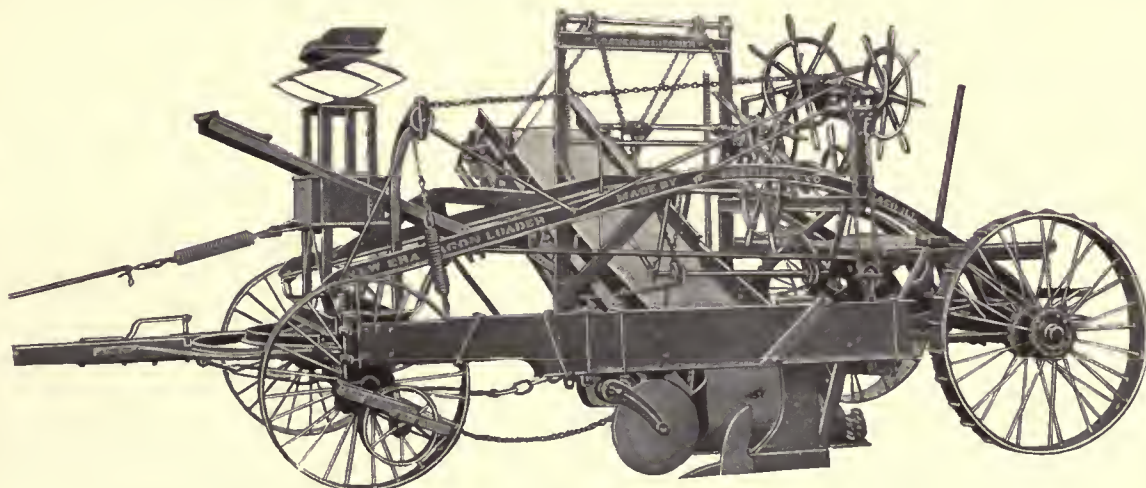
JAMES LEFFEL & CO.

Springfield, Ohio, U. S. A.

316 Lagonda Street

Don't Ask Us—Ask the Users

who are all successfully building canals, ditches and railroads with the New Era Elevating Grader—Wickham Bros, Council Bluffs, Ia.; Bartlett & Kling, Scottsbluff, Neb.; Winston Bros. & Co., Minneapolis, Minn.; Alex. Mead, Greeley, Colo.; H. H. Whittier, Northfield, Minn.; P. E. Shugart, Nevada, Ia.; Russell Condon, South Omaha, Neb.



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The field is unlimited and uncrowded; marketing the product in competition with the clay interests and at clay tile prices produces a great profit and a glance at the future spells only success for the factory or business started today.

No existing proposition offers such flattering inducements or such a field of opportunity for the man looking for a vocation or for the man looking for an investment. No other business can net you such profits on the amount of capital involved, and no other business has such an unlimited future.

Just think of a business paying from 30% to 50% on the investment the very first season, and subsequently from 50% to 150%, then ask yourself the question—Is it worthy of investigation?

Our literature gives you all the details regarding the merits of cement tile, the cost of manufacture, the amount of capital required to embark in the business; how to build your factory and last, but not least, it tells you how we aid the manufacturer using our machinery and gives you our full and complete proposition. A short letter telling that you are interested will bring complete data.

The Cement Tile Machinery Co.

172 Rath St., Waterloo, Iowa.

This Cot
Weighs
Only
30 Pounds

Can Be Set
Up or
Folded in 30
Seconds

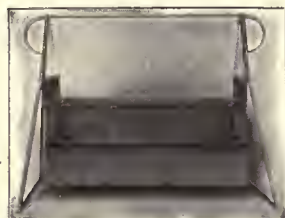


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Fitted With
Heavy Canvas
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FOR OUT-DOOR SLEEPING

Designed for Campers, Fishers, Hunters, Miners, Prospectors, Ranchmen and Invalids

There is no more popular or useful article of porch or lawn furniture made than the ENTERPRISE COUCH HAMMOCK. It can be used as a couch, settee, hammock or an out-door bed and is so thoroughly well constructed that it is almost indestructible.



Enterprise Couch Hammocks

The "Kumpak" Cot



Ideal because of its simplicity. Extends into a bed 27 x 73 in. Folds into a package 3x7x38 in.

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SUPERIOR

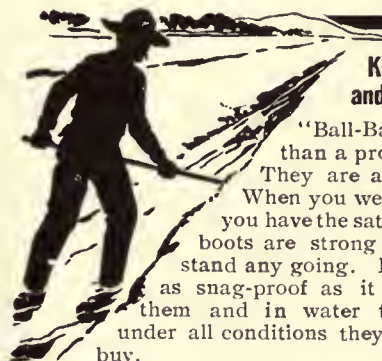


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No matter where you live or what your seeding conditions are, you can get a **SUPERIOR GRAIN DRILL** that will fill the bill and do your work in the best possible manner. Superior Drills are made in all sizes and every style. Every Superior Drill is sold under a warranty that absolutely protects the buyer. Send for catalogue. Read it and go to your local dealer and insist on seeing the Superior Drill.

AMERICAN SEEDING MACHINE CO., (Inc.)
Springfield, Ohio

GRAIN DRILLS



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Twenty-Eighth Year

THE IRRIGATION AGE

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CHICAGO, JANUARY, 1913.

No. 3

THE IRRIGATION AGE

With which is Merged

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THE IRRIGATION ERA
ARID AMERICA

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MID-WEST
THE FARM HERALD

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D. H. ANDERSON, Editor

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Discussing Revision Utah Irrigation Law

The state of Utah is discussing the
revision of her irrigation laws in
order to create a board of control for
the adjudication of all issues arising
over water rights, the decisions of
the board to be subject to appeal to
the courts. This revision is strongly urged by state
engineer, Caleb Tanner, in his biennial report to
Governor Spry.

Mr. Tanner says that Utah's irrigation laws and
system of adjudication have progressed to a crucial
point, where they must be brought to the test or
else abandoned entirely in favor of a new system.
The present system, he declares, is unique, in that
it has no parallel in the other states.

Would Abolish Immigration Bureau

A report comes to us that the state
of New Mexico is considering the
question of abolishing its state im-
migration bureau which has been in
existence for many years.

This bureau has been the means
of keeping people outside of New Mexico posted as
to the resources and possibilities for settlement in
that state, and it is a pity to abolish an organization
that has accomplished so much for the state.

When the bureau was under the control of the
late Max Frost, great quantities of instructive liter-

ature were sent out, and subsequently under the guidance of Mr. H. B. Henning much publicity was obtained for New Mexico through the distribution of literature and exhibits of the products of that state at various land shows throughout the country.

It is our opinion that the government of New Mexico should consider well before doing away with an institution of this character.

Method for Keeping Irrigation Records

We have numerous inquiries from the secretaries and other officials of private irrigation corporations, concerning the matter of a satisfactory set of account books to be used in connection with their work.

A letter recently received, states that one concerns has 16,500 acres under a canal, with about 110 stockholders, and that they are anxious to find some system of keeping accounts which has been tried on a canal of about that size; the system to be simple and at the same time effective.

The idea is to secure some plan which will allow for the distribution of accounts under, say ten different heads—for example, "headgate costs, lateral maintenance, etc."

The local officers of an organization of this character usually work out some rough system that will fill their immediate needs, but in many cases these roughly framed systems are not satisfactory.

Our object in calling attention to this matter is to learn the best plan from some of our readers who have a well-conducted system, so that the suggestion may be offered to our readers for general use.

If anyone who reads this is acquainted with a stationer who prepares sets of books adapted to this particular line of work, they will confer a favor by sending the stationer's name and address to the IRRIGATION AGE.

Reclamation Officials File On Govern- ment Land

We have heard nothing recently concerning reports that came to us regarding land being filed on in the Belle Fourche tract by officials of the Reclamation Service.

Mr. Blanchard, of that service, informed representatives of the Colonization Department of Western Railways at one time, that this was absolutely necessary in the Belle Fourche district, as it was impossible to rent or purchase homes near that tract, and that the officials found it necessary to do this in order to establish a home while they were employed in that work.

On the other hand, the complaints that reached us originally from there, stated that certain of the reclamation officials had entered land under the

reclamation law, more favorably located, owing to their knowledge of the location of ditches, etc., than was possible by a settler who was not familiar with the plans under which the project was worked out.

If this is contrary to the law it seems to us that some better explanation should be given than that made by Mr. Blanchard. It can be readily seen that a reclamation official in charge of the work of laying out ditches and laterals, could make a selection more advantageously than could a settler who had no knowledge of the plans under which the project was developed.

Mr. Newell has never seen fit to offer any explanation publicly on this subject. Perhaps it would be a good time now to go into it.

Bailey Criticises Reclamation Service

George M. Bailey, president of the Northwest Townsite Company, a concern that has done much to develop property throughout the northwest, particularly along the new line of the Chicago, Milwaukee & Puget Sound Railway, is criticising F. H. Newell, Director of the Reclamation Service, for saying that after the United States has spent \$75,000,000 in arid land reclamation work, yet the farmers of the middle west and eastern states have not come to take the land for agriculture.

Mr. Bailey states that Director Newell confesses his own incompetence by this statement, and asks what people would think of any private corporation that would spend \$75,000,000 in reclaiming waste lands, fitting them for cultivation and settlement, and then sit down and wonder why American farmers who live two thousand miles away, do not come and take the land.

The IRRIGATION AGE has repeatedly suggested some kind of an organization for selling lands, and this matter was brought to the attention of Mr. C. J. Blanchard, of the Reclamation Service, at the time of the meeting of the colonization agents of the different railways held in Chicago, early in 1912. Mr. Blanchard stated at that time, that almost all of the reclaimed lands had been filed on under the regulations of the reclamation act, and that there were very few projects left, under government control, where any work was necessary for colonization.

This statement does not "jibe" with what Mr. Bailey informs us has been stated by Mr. Newell, Director of the Reclamation Service.

Mr. Bailey's idea is that a broad system of publicity should be adopted to familiarize prospective settlers with conditions existing in various parts of the West. On the other hand, Mr. Newell informed a representative of the IRRIGATION AGE, that it was extremely difficult to change the reclamation

law so as to permit of a fund for advertising. He stated that it was almost impossible to get action by the Committees on Irrigation of Public Lands, and furthermore, that if it were possible to do so, he doubted very much if action could be secured which would lead to a change in the law to benefit the reclamation bureau, through the expenditure of money for advertising.

It appears to us that it would not be difficult if the matter were properly exploited, to get the irrigation or public lands committee to act, by discussing this matter with a view to changing this law.

The supposition is that the reclamation service is not in good standing with the members of the committees, otherwise it would not be difficult to carry this point.

If any of our readers have suggestions to offer that will remedy this condition we will be glad to give them publicity.

Is Money Necessary To Pass Bill

In a recent issue of the *Riverside, California, Press*, we note mention of the National Reclamation and Irrigation Association, which is interested in the Newlands bill, which proposes the expenditure of \$50,000,000 on water storage in southern California.

The editor of that journal is inclined to criticize the position of George H. Maxwell and others interested in the National Reclamation Association.

The *Press* is evidently impressed with the idea that the movement is a good thing for George H. Maxwell and his co-laborer Booth, of Los Angeles, who are the leading spirits in this association.

The *Press* states "for instance, Stockton is about to raise \$42,000 toward a fund to promote the passage of the Newlands bill." Of this sum \$10,000 is to be used towards paying Maxwell's salary for two years, and \$200 a month for copies of his paper, which has recently been revived and is published under the title of "Maxwell's Talisman."

In view of the fact that similar propositions have been made to various other cities interested, it is easy to figure out a very fair profit for Mr. Maxwell and those associated with him.

In the first place, he is securing thereby a list of 2,400 subscribers, or at the rate of \$1.00 per year, for 200 subscribers per month, which is not directly in harmony, as we understand it, with the postal laws.

The *Press* is inclined to think that Maxwell may be worth the salary asked from the city of Stockton.

We have learned since the article appeared that an appropriation of a certain sum of money has been made for use in the passage of that bill, but it is

difficult to understand why it is necessary to expend money in Washington to carry through a bill of this character, if it has merit.

If this work is being done in a dozen or more towns which may be more or less interested in the subject, it can be readily seen that Mr. Maxwell will take down a good salary, and the question that confronts us, is why should Mr. Maxwell take the matter up, and be so vigorous in its support, if it is not true that he is to draw down a large sum for himself and friends.

The public throughout the west, generally, were familiar some years ago with Mr. Maxwell's activity along similar lines in connection with the Reclamation Law, and both he and Mr. Booth of Los Angeles, were discredited at the National Irrigation Congress held in Portland, Oregon, where a resolution was passed stating that the National Irrigation Congress had authorized no one to collect money in its name for any purpose, and that all of the money necessary to carry on the work of the congress was contracted by the citizens of the city in which the congress is annually held.

Mr. Maxwell's profession is that of a lawyer, but it is doubtful if he has spent any time in pursuit of the law since his effort to discredit the irrigation bonds issued under the Wright Act in California many years ago.

Would Make Easier Terms For Settlers

Immigration Commissioner, Roy Schenck, of Wyoming has a novel plan to attract settlers with limited capital to that state.

The recommendation made by the commissioner in his biennial report, appeals to the present legislature, and states that Wyoming owns many thousands of acres of fine land patented to it by the United States Government under an agreement entered into when the territory of Wyoming was admitted to statehood. The state of Wyoming also owns the water of all streams.

The commissioner proposes that an area of ten thousand acres of state land, which is susceptible of irrigation, be set aside for conversion into reclaimed farm tracts, all work of reclamation and equipment to be taken care of by the commonwealth.

His idea is that an irrigation system should be constructed by the state and all ditches for the reclamation of the ten thousand acres should be ready for use when the settler is prepared to move on the land. Each forty or eighty-acre farm should be fenced; half of the area plowed ready for planting; wells sunk; barns and windmills erected; roads school houses and other public utilities provided.

The cost to the settler of each farm would be

just what the state pays out in bringing it to the condition described.

It is believed that an appropriation of \$400,000 by the present legislature will be sufficient to try out the plan on ten thousand acres. If the reclamation and equipment of the land should cost the full appropriation, or \$40.00 per acre, then the land, plowed and ready to work, including a perpetual water right, would cost the settler \$50.00 per acre, of which \$5.00 per acre would be payable at once, and the remaining \$45.00 per acre in annual installments, covering a period of ten years.

It is not the intention of the promoters of this plan that the state of Wyoming should profit from its investment, except in the advertising which naturally would accrue to the state as the result of its unique method of attracting settlers.

It is the opinion of the IRRIGATION AGE that this plan, if carried out properly, would be the best possible means of attracting a high grade of settlers who would be able to take over the property under conditions described, and "make good" from the first year.

Wyoming could go farther still by following the plan adopted by some of the states of Australia, whereby the crops are put in so that all the settler has to do is take care of and harvest them when ready, thereby giving him a good income from his first year's work with which to lay a better foundation for the future. This plan would be going Australia one better, as it would fully equip the settler with the exception of what would be necessary for farm machinery, household equipment, livestock, etc.

There are very few who are desirous of making a home in the west who have not saved sufficient money to stock a forty or eighty-acre ranch sufficiently well to succeed in building it up in the future years.

As our readers are no doubt aware, the Australian government sells land to settlers at three per cent down and the balance payable in annual installments covering a period of thirty-two years, with interest at six per cent.

The Australian government also stands ready to advance sixty per cent of the cost of buildings and permanent improvements on the farm.

As we understand the suggestion from Wyoming, there would be no immediate expense to the settler for fencing or building ditches. That would come out of the full amount payable at the rate of \$5.00 per acre cash, and balance in installments, as outlined. Australia, on the other hand, offers settlers the land in crop, and this would be a good plan for the Wyoming officials to follow, as the addi-

tional expense would be moderate, and it would prove much less burdensome for the settler.

We hope to see the lawmakers of Wyoming pass this bill so that it may be tried out. Some efforts of this character must be made by the individual western states in order to keep colonists from the "Canadian route," which many are at present traveling.

Investigation Committee Good Move

In view of the suggestion by Senator Borah of Idaho, of the appointment of a committee to investigate the work of the Reclamation Service, we are reminded of a statement of an eastern contemporary and claims made in its columns that there has been enormous waste in the federal government's great irrigation enterprises, and assertion is made that these charges can well be relieved because "it is the normal thing for such vast governmental undertakings, and the reason why they are regarded dubiously by many who fully recognize the value of the end sought."

It is furthermore urged that there is "an insidious corruption in the opportunity to spend great appropriations, which only constant vigilance and strenuous efforts can counteract." This position is illustrated in the political pull exerted from so many directions to have great appropriations for harbors and deep waterways and flood prevention, and in the resisting influence to the effort to eliminate unnecessary work of this character.

A Mr. Hensley, of Missouri, chairman of the sub-committee which has been investigating reclamation work in Arizona, thinks that of an appropriation of \$10,000,000 about \$7,000,000 were wasted, and he even ventures to suggest scandals and other unpleasant subjects, and his conclusion is "of course the whole affair will have to be thoroughly investigated, and in the meantime judgment may be suspended, but it may be remarked that a little of the fierce white light of publicity which beats upon Panama, will be an excellent thing for other great government undertakings."

To one who is familiar with conditions existing under various laws; and the bureaus supposedly controlled by these laws, this seems like a timely suggestion, and there should be no opposition to Senator Borah's effort to appoint a committee and secure appropriations to carry on the work of going over this matter carefully.

If the work has been properly performed, the reclamation officials need not fear a rigid investigation. If mistakes have been made by reclamation officials the facts should be given to the public from whom the money for carrying on this work comes, indirectly through the sale of public lands.

If there has been flagrant violation of the law, or in fact, minor violations, which have hampered the settler in establishing a home under any of the various reclamation projects, these facts should be brought to light so that the public may understand clearly what is being done with money that the government is using for this purpose.

As one writer says, "the people of the irrigated region generally believe in the reclamation service, and in the honesty of its efforts to do its work under the law." If there has been any such misappropriation of money as is hinted at by Mr. Hensley, certainly the people of the arid regions are the ones most interested in finding it out, for there has been a lack of money to prosecute reclamation projects that have been undertaken. To go farther, it may be said that the reclamation officials were possessed during the days immediately following the passage of the reclamation law, with the same fever that attacked the various bond houses throughout the country, who were anxious to secure all of the water fillings and rights for developing particular tracts with a view to head off competitors. There is no doubt but that in the early days the reclamation service felt that with the government's action in this interest, an impetus would be given to irrigation and reclamation generally, and the government engineers were immediately scattered throughout the west to file on everything available, so that the private interests would be held back until the government had decided which would be the best. In this manner many sections of the country have been barred from development by the filings of the reclamation service.

This is particularly true in one section that we have often mentioned, i. e., the Owens Valley in California. The history of the action of the reclamation service in that tract has been gone over many times in our columns, and it is not necessary to go into details further than to say that the old-time settlers, as well as those who were prospective colonists, were barred from advancement by the combination worked out through the reclamation service and forestry bureau, under the Pinchot regime, and the moneyed interests of Los Angeles, California.

There are numerous instances of this kind to be cited, and if a committee is appointed, all of these affairs should be gone into thoroughly.

Another illustration of the reclamation service's policy of handling the matter, may be cited in connection with the filing on the water of Big Payette Lake, Idaho. The government immediately filed on this fine body of water, and we doubt today if there are a thousand acres under proper cultivation in Long valley, lying south of the lake. The waters

were filed on in Big Payette Lake to take care of certain lands in the Boise and Payette districts, and unless work has been started recently, the reclamation service has ignored the Long valley territory with its thousands of productive acres.

This valley is nearly equal in extent to the famous Bitter Root valley of Montana; is surrounded by mountains and is well calculated to prove a wonderfully fine agricultural district when development is permitted by furnishing water from Payette Lake, which forms its northern boundary.

These two cases will give some fair idea of the character of the work which should be performed by such a committee as Senator Borah suggests. This committee would not be likely to enter into investigation of the problem now brought forth by the Newlands bill for storage of storm and flood waters, although that would naturally come under its notice in a general and thorough examination.

* * *

A recent issue of the Portland, Oregon, *Telegram*, states that official recognition has been taken in the effort of J. N. Teel, chairman of the Oregon State Conservation Committee by the Secretary of the Interior's office, and as a result the National government may pay one-half of a \$100,000 fund to investigate the utilization of the water power and irrigation of the Des Chutes River.

The idea is to make a careful investigation of the Des Chutes River with a view to securing the highest possible utilization of the waters for irrigation and power under public control and free from the evils which have hitherto followed the unregulated exploitation of water resources in Oregon.

The plan has been endorsed by the acting secretary of the interior, and in a recent letter he states that he is impressed with the suggested co-operation and the matter will be brought to the attention of Secretary Fisher.

It is urged that one-half of this fund should be taken from the reclamation fund. It is doubtful, in the mind of the writer, if this will meet with the favor of the reclamation officials, but if Secretary Fisher decides favorably, there will be no difficulty in carrying out the plan, provided the funds are available. On the other hand, it should be remembered that the Reclamation Service has apparently insufficient funds from "their revolving fund plan" to carry out the work that is being called for under the various projects now contemplated or in operation.

The Des Chutes River is one of the finest streams in the west, and the country tributary to this valley will become wonderfully populous and productive when fully opened up. This territory has all of the advantages of a good climate, fine soil and an abundance of water.

THE CAUSE OF THE PRESENT STATUS OF IRRIGATION SECURITIES.

By A. L. Fisher.*

The present status of irrigation securities and the failure of so many irrigation projects in the West is directly due to the desire for exorbitant profits on the part of the promoters who organized, and the bond houses who financed the different schemes. Add to this, the fact that none of the projects that failed were given the proper investigation and, the cause of the failures may be easily traced.

It is quite probable that a number of those who have been instrumental in bringing out projects will take issue with both of the above statements, and, to refute the first, will point to the fact that most of the promoters and bond houses that brought out the various schemes, "hit the rocks," and many of them are there yet. That is very true, and is probably as it should be in view of the methods used.

In very few of the projects not over fifty per cent of the money obtained from the sale of bonds was put into actual construction. In some cases the amount did not reach over thirty-five per cent. The balance was divided up as bond discount, representing the profit to the house handling the bonds, and an amount ranging from twenty per cent up to as much as the house could "conscientiously" take, construction profit, large legal fees and numerous items of outlay such as operation, engineering, etc.

On many of the projects the bond house organized a construction company or, at least, held a large interest in the company which took the contract. The word "took" is used literally, because the contracts were not given to competitive bidders, but the entire job was undertaken for the entire bond issue, this amount being fixed by the construction company and the bond house, and was a matter in which the people of a district had very little to say. It is true they had to vote at a legal election on the contract and bond issue, but they always voted it.

The reason that so many of the sponsors of these projects are in a bad way financially, is that in their eagerness to float as many as possible they used the money due one project to start another, and became entangled in their own nets.

Regarding the lack of proper investigation, it will be pointed out that exhaustive reports of a very satisfying nature were made by prominent engineers, and opinions rendered by leading attorneys, and that the reason for the failure is that the people benefited by the irrigation system will not pay. As a matter of fact, the projects were so overloaded with profits and the construction work dragged out over such a length of time, that the people, however willing they might be, were unable to pay. That stumbling block proved their undoing, and, in all business sense, should have been a matter to receive the most thorough investigation.

The reports mentioned have gone very extensively and technically into the matter of water supply, soil conditions, markets and transportation, yet a search

through their pages fails to reveal any detail as to the character and financial condition of the people under the system, and their willingness and ability to meet the obligations they have taken upon themselves. In a number of the projects upon which bonds have been sold, not more than fifteen voters participated in the organization of a district, and voted a million or more dollars indebtedness upon themselves as cheerfully as they would attend a general election and vote for the man of their choice for a public office. After all, when it comes to the final analysis, it is the people who have to pay and five times the quantity of water on three times the quality of soil will not make a paying irrigation project, unless the settlers on that project have a proper realization of their responsibilities and willingness, energy, ability and a chance to meet them. There is no bank in Chicago or elsewhere that would loan a large sum of money, as a business proposition, to an industrial concern on its assets alone. The ability and standing of the owners and the quality of the management have as much to do with making the loan as the physical value of the assets. Yet large loans have been made upon irrigation projects, the men who made the loan evidently forgetting that water and land have small value separately, and their value, when one is applied to the other, is only determined by the intelligence and energy used in such application.

Irrigation is the greatest factor in the development of the West. The ditches and canals are the arteries that carry the life blood of Colorado and her sister states. Colorado, with over \$50,000,000 as the value of its agricultural crops in 1912, is commanding attention as one of the great agricultural states of the Union. Ninety per cent of this value was created by irrigation, and it is folly to say that irrigation development must lie dormant, because the greed and lack of foresight of a few have served to bring into disrepute a great industry.

The man who makes two blades of grass grow where none grew before, is a benefactor, but before the full measure of his benefaction is conceded, let us be sure that the grass is growing and will continue to do so.

It has been suggested that Colorado and the other western states where irrigation development has suffered, should clean house. That may be true in a measure, but a considerable assistance in the house cleaning should come from those who are genuinely interested in all that makes for the good of the country at large. The settlement of the West, and the production of foodstuff, sheep and cattle, all of which means the irrigation of arid lands, is of vital importance to everybody, everywhere.

Let the owners of these failures fall upon those who instigated them and not upon the states that were forced to submit to their depredations. The business of reclaiming and settling the western lands should go ahead with a renewed impetus, but strictly as a business and not as a gambling or bond jobbing scheme.

Promotion and excessive bond and construction profits should be eliminated and every effort made to get the price of water down to a basis where it will be no hardship for the people to pay. Investigation along all lines should be thorough and by people who understand how to make such investigations. Under these conditions the return upon the capital invested would be ample, and the increase in business of all lines, by reason of such development, would be felt for all time to come.

*Bond Department, Interstate Savings Bank, Denver.

CONCRETE MANURE PITS.

Every farmer knows the great value of barnyard manure as compared with other fertilizers and he also knows, or should know, that a vast deal of it is wasted when piled in the open or stored in sheds or pens. The purpose of this brief article is to tell him how to preserve its full value at minimum cost.

When left in the open manure deteriorates in fertilizing properties and is washed away by rain.

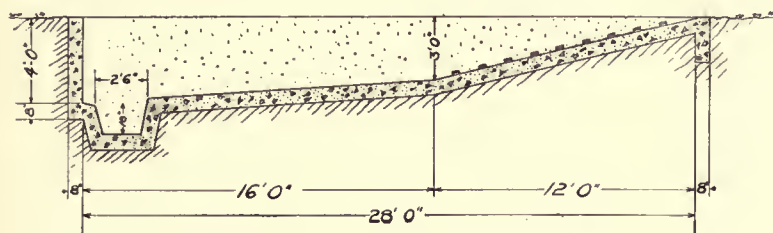


Fig. 1.—Sectional Drawing of Shallow Concrete Manure Pit.

Stored in sheds or pens, heating or "firing" takes place through lack of moisture. The remedy for these conditions has come with the advent of the concrete manure pit.

The concrete pit when properly made is waterproof, thus insuring the proper degree of moisture and also the preservation of liquid manure that formerly ran to waste.

Will a concrete pit pay? The answer is that from 30 to 40 per cent of the strength of manure is wasted under the extravagant practices described above. Government experts have estimated that one load of manure stored in a concrete pit is worth from $1\frac{1}{2}$ to 2 loads of manure cared for in the ordinary way. This is a large percentage in favor of the concrete pit.

It is comparatively easy to handle manure from the pit and especially so when liquid manure is needed for the garden or truck patch. It can be pumped from a sump hole made at one end of the pit for that purpose.

In a majority of cases farmers will probably find the shallow manure pit the most convenient and practical. The sectional drawing (Fig. 1) shows the type of construction. These pits are especially convenient when manure is hauled to the fields frequently. They should be constructed as follows:

The walls and floor are 5 inches thick. The clear dimensions of the pit are: Depth, 3 feet; width, 6 feet; length, 12 feet. Dig the trench 3 feet 5 inches by 6 feet 10 inches by 12 feet 10 inches. By keeping the sides vertical only an inside form will be needed. Frame the sides and ends separately. For the sides cut the 1-inch siding 12 feet long and nail it to four 2 by 4 inch uprights 3 feet long and equally spaced. The end uprights for the sides are 2 by 4 inches nailed flat to the siding; the others are also 2 by 4 but are nailed on edge. It is not necessary to cut these uprights to exact lengths; they may be allowed to extend above the siding. Make the siding for the

end sections of the form 5 feet 2 inches long and at the ends nail it to the edge of two 2 by 4 inch uprights. Place a single 2 by 4 upright between each end pair. Cut four cross braces, 5 to 10 inches long, from 2 by 4 inch timbers. Have enough sections of woven-wire fencing, $7\frac{1}{2}$ feet long, to cover the bottom of the pit.

The concrete should be a mixture consisting of 1 bag of Portland cement to 4 cubic feet of pit gravel or 1 bag of Portland cement, 2 cubic feet of sand and 4 cubic feet of crushed stone. Crosswise tamp in a section of concrete (not too wet) 2 inches thick and a little wider than the strip of woven-wire fencing used as reinforcing. Lay the wire with an even division of the extra length, so that it may project upward into the side walls. Tamp in the remaining 3 inches of concrete. Work rapidly and complete the floor. No facing mortar is needed.

Immediately set up the forms on the finished floor so as to allow a 5-inch wall on all sides. Join them by nailing together the 2 by 4's at the corners of the sides and ends. Do not drive the nails home. Cross-brace with 3 by 4's and with 1-inch boards from each central end upright to the second side upright.

Quickly begin filling the forms with concrete almost wet enough to pour, and keep it practically the same height on all sides. Puddle the concrete by running a long paddle up and down next to the form. Do not punch the earthen wall. Dirt in the concrete



Fig. 2.—Large Type of Concrete Manure Pit. Pump Shows at Left Hand Side of Pit.

may make a poor wall. If the top of the earthen wall tends to crumble, hold it back with 1-inch boards braced against the forms. To keep out flood water, the pit may be extended 6 inches above the ground by using the lower half of a 1-foot board to hold back the dirt, by allowing the remainder to project above the ground level, and by adding 6 inches to the height of the inside form. Remove the forms after the concrete has set four days by first drawing the nails in the corner 2 by 4's. The pit may be used after 10 days.

Where manure must be stored for a considerable length of time, larger pits or basins are required. Such pits are seldom made over 5 feet deep (in the clear at the deeper end) and are wide enough that the manure may be loaded on a spreader in the pit and drawn up a roughened concrete incline or run. The slope for such a run must not be steeper than 1 foot up to 4 feet out.

In building such a basin as planned in Fig. 2, use a team with a plow and scraper to make an earthen pit in which to build a concrete basin of the clear dimensions shown. In laying out the earthen pit, bear in mind that the concrete walls and floor are 8 inches thick and make due allowance for the same. With a spade trim the sides and the deep end vertical.

In order to form a sump hole from which the liquid manure can be pumped, in one corner at the deep end of the pit dig a hole 18 inches deep by 2½ feet in diameter. To protect the concrete floor, at the upper end of the driveway excavate a trench 8 inches wide and 2 feet deep for a concrete foundation apron. Extend it around the corners and slope it upward to meet the driveway incline.

In general, the framing of the forms is similar to that of shallow pits. If the earthen walls stand firm, only an inside form will be needed. Otherwise, build an outer form. For the forms use 1-inch siding on 2 by 4-inch studding spaced 2 feet 8 inches. These uprights need not be cut to exact lengths. Save lumber by allowing them to extend above the siding. Stiffen each section of the form by nailing a 2 by 4-inch scantling to the uprights at top and bottom of the forms.

Erect the forms in the pit. Set them on 8-inch concrete blocks or bricks, so that the floor may be built under them. To prevent bulging, cross-brace the forms with 2 by 4-inch timbers. Begin filling with concrete, as for shallow manure pits, and do not stop until the job is completed.

Lay the floor for the bottom and the incline the same as for shallow pits. To give teams a sure footing on the incline, embed in the concrete the turned-up ends of iron cleats bent at right angles, similar to a capital U. Old wagon tires, cut in lengths not greater than 20 inches and turned up 4 inches at each end, will do. Leave 1-inch clearance between the cleats and the concrete, and set them so as not to obstruct the wheelway. Space the cleats 14 to 16 inches. Roughen or corrugate the bottom crosswise every 6 inches by using a 5-foot length of 2 by 4-inch scantling beveled lengthwise to the shape of a carpenter's chisel. To make the corrugations, set the timber with the beveled face toward the incline. Strike the 2 by 4 with a heavy hammer, so as to indent the concrete to the depth of an inch.

If a shed roof is required, insert in the top of the concrete walls while still soft, several ½-inch bolts, which should project about 2½ inches above the wall, to which the roof timbering or cover may be fastened.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.

TWO SERIOUS CASES UP.

The Rocky Mountain News of Denver, Colorado, in a late issue, has the following to say concerning a serious condition which has arisen in connection with other states.

"The decision of the Supreme Court of Colorado, which invalidates the \$50,000 appropriation made by the eighteenth general assembly for the defense of the public waters of the state, is undoubtedly proper, but it is very much to be regretted that the bill making the appropriation was so drawn as to make this decision necessary," said C. W. Comstock, state engineer, who issued this statement yesterday.

"The state of Colorado faces two vigorous attacks on its rights to control and utilize the waters in its streams. These attacks are not simply threatened, they are actual.

One is the suits filed by the state of Wyoming in the Supreme Court of the United States, in which the state of Colorado, the Laramie-Poudre Irrigation Company and the Greeley-Poudre Irrigation district are named as defendants.

"The complaint in this suit attacks the right of the state of Colorado or its citizens, or any one in it, to divert the waters of the Laramie river out of the watershed of that stream. The stake is approximately 100,000 acre-feet of water per annum, which is to be diverted through the Laramie-Poudre tunnel for use on the lands of the Greeley-Poudre Irrigation district.

District Has Spent \$3,000,000.

"This district has issued approximately \$5,000,000 in bonds and up to date expended something like \$3,000,000 in construction work, including the Laramie-Poudre tunnel, some two miles long. Should the state of Wyoming prevail in this suit, the water supply of the Greeley-Poudre district will be entirely inadequate and the district bonds will be practically worthless.

"The irrigation and reclamation of these lands would mean the addition of \$100,000,000 to the taxable property in Colorado, and an increase of thousands in its population. Is it fair to say that the state, as a whole, is not interested in the defense of a suit of this importance?

Kansas Case Serious.

"In the Circuit Court of the United States for the District of Colorado, the United States Irrigating Company, representing certain interests in Kansas, has filed a suit against the state of Colorado, and a large number of irrigation companies in the Arkansas valley, to require these defendants to permit something like 350 cubic feet of water per second to flow constantly across the Kansas line for the supply of ditches in Kansas some sixty miles from the Colorado line.

"The ditch companies named as defendants are responsible for the irrigation of more than 300,000 acres of land in Colorado. To supply the 350 cubic feet per second demanded by the complainants in this case would, because of the heavy losses in transit, deprive ditches in Colorado of fully three times this amount.

All Colorado Involved.

"The result would be that fully 100,000 acres of
(Continued on page 88)

TRACTION PLOWING.

Better farming requires modern implements and rational methods.

Modern farm implements are as superior in mechanism and results to those used by our grandfathers as the automobile is to the ox-cart as a vehicle.

Probably no other modern farm implement is gaining more popularity than the engine plow.

Because it has been successfully proven that a good engine plow expedites the farmer's work and very materially lessens the cost of plowing. This means more profit to the farmer, and he is not slow in taking advantage of this fact.

Cost of Plowing with Horses.

Accurate records show that to maintain an average work horse requires almost \$80.00 per year. This includes feed, bedding, harness, halters, shoeing, etc. Adding \$10.00 for depreciation, the total annual cost per horse is \$90.00.

The same records referred to above show that the ordinary farm horse averages only about three hours' work per day throughout the working year of 313 days, in spite of the fact that he is a constant care and expense, whether profitably employed or not.

Figured in dollars and cents, the power furnished by one horse costs at least 91-3 cents per hour. The power furnished by three horses for ten hours creates an expense of \$2.80, or about \$1.90 per acre for plowing.

On farms of any considerable size, the figure will be even higher, because it is necessary to have additional horses in order to keep a given number in the field.

Engine Plowing Cheaper.

Data carefully compiled by competent authority in regard to the cost of engine power for plowing shows the average expense for all sections of the country to be about \$1.40 per acre for both steam and oil traction.

This includes depreciation, interest on investment, repairs, labor, fuel and all other items of expense ordinarily incurred.

The very large steam outfits, under favorable conditions often bring the plowing expenses down to less than \$1.00 per acre, but this is the exception rather than the rule.

Other Advantages.

Probably one of the greatest advantages of engine plowing is being able to do the right thing at the right time.

If land is plowed when in the best condition, bet-

ter crops will be harvested and the gain produced will often cover the cost of a traction plowing outfit in one or two seasons.

If it is necessary to rush the work, one can change crews and keep the engine outfit running day and night. Horses will not stand such hard work.

In addition, the work is uniform, which is not ordinarily true of that done by several horse-drawn plows. This means a great deal in the preparation of a good seed-bed which is essential to the production of big yields.

Quantity and Quality of Work.

An engine plow of the better class, properly adjusted, will do just as good work as any kind of plow and sometimes better. For breaking, backsetting, stubble plowing or for work in difficult soils, the engine plow gives perfect satisfaction, provided, of course, the right style of bottom is used. The better manufacturers provide these in sufficient variety to meet all soil conditions.

In weedy or stone ground, the good engine plow is unexcelled for fine quality of work. The covered frame runs so close to the ground that it breaks down all weeds so that they are completely covered without the use of chains except on the front plow.

The flexibility of the engine plow results in most excellent work in stony ground and does not suffer so much on account

of breakage of shares as is ordinarily experienced with other styles of plows. This is due to the fact that any of the bottoms automatically jump over solid obstructions when encountering them.

Size of Plow to Buy.

Sod so tough that a 45-brake horse-power (22 tractive horse-power) gasoline or kerosene engine could not pull four 14-inch breaker bottoms through it has not been found. In many cases an engine of this power has pulled eight 14-inch breaker bottoms successfully.

Under average conditions, six 14-inch boldboard plows make a suitable load for breaking and eight for stubble plowing.

A noted experiment station authority says:

"On a great many one hundred and sixty acre farms the traction outfit will be found profitable for plowing. On larger farms, it is an undoubted success. There is no question but that the engine plowing outfit has come to stay, and when properly handled, greatly reduces the cost of turning the soil."

In short, the engine plow does the highest grade of work at the most economical figure.



A 14 Bottom Engine Plow at Work.

Supreme Court Decisions Irrigation Cases

FAILURE TO SUPPLY WATER.

Where a party entitled to be supplied with water by an irrigation company made due effort to require the company to furnish water, and tendered the full legal water rate, he was not, as a matter of law, required, as a condition precedent to recovering more than nominal damages for not being supplied with water, to tender an additional amount demanded by the company and sign a contract, which he feared would estop him from subsequently asserting his rights; but the reasonableness of such demand was for the jury. *Northern Colorado Irr. Co. v. Pouppirt*. Court of Appeals of Colorado. 127 Pacific 125.

RIGHT TO RESCIND PURCHASE OF LAND.

One is not entitled to rescind executory contracts for the purchase of land on the ground of misrepresentation that there was an inexhaustible supply of water to irrigate the lands, where he did not act promptly after becoming aware of the actual conditions. *Angel v. Columbia Canal Co.* Supreme Court of Washington. 125 Pacific 766.

ADVERSE POSSESSION.

Plaintiffs are entitled to use one-half of the water of a stream for irrigation, as against defendant, where plaintiff's predecessor had an agreement with defendant's predecessor for such use, and continually used it for 19 years as appurtenant to the land, under claim of right. *Allen v. Roseberg*. Supreme Court of Washington. 126 Pacific 900.

STATUTORY APPROPRIATIONS.

The waters of the Pecos river are public property, subject to the easement right of riparian owners to use such water as is reasonably sufficient for domestic and stock raising purposes and for irrigating the riparian lands, and a statutory appropriation of the water in excess of the riparian owners' needs is effective. *Biggs v. Lee*. Court of Civil Appeals of Texas. 147 Southwestern 709.

RIGHT OF WAY FOR DITCHES.

Act June 15, 1880, c. 223, § 3, 21 Stat. 203, providing for allotment in severalty of lands of the Ute Indian Reservation in Colorado, further provides that "all lands not so allotted shall be held and deemed to be public lands of the United States and subject to disposal under the laws providing for the disposal of the public lands at the same price and on the same terms as other lands of like character, * * * provided that * * * said lands * * * shall be subject to cash entry only in accordance with existing law." *Held*, that it was competent for Congress to change the manner of disposition of such lands in so far as third parties were concerned, and that persons taking preemptions thereon after the passage of Act Aug. 3, 1890, c. 837, § 1, 26 Stat. 391 (U. S. Comp. St. 1901, p. 1570), reserving from all public lands thereafter taken up right for ditches and canals constructed by authority of the United States, took subject to such provision. *United States v. Van Horn*. U. S. District Court, District of Colorado. 197 Federal 611.

CHANGE IN POINT OF DIVERSION.

Where E. & E. appropriated 480 inches of water of a certain creek and diverted the same from the creek in 1872, and applied the same to their lands, and thereafter in 1876 constructed another ditch lower down the creek for the purpose of diverting a part of their appropriation from said creek, and did so divert after 1876, and thereafter in 1879 H. made an appropriation of water from said creek, and diverted it below E. & E.'s 1876 diversion, and thereafter E. & E. sold their land and water rights to other persons, among them B., and B. thereafter conducted about half of the water awarded to him through said ditch of 1876 and about half through a ditch constructed in 1886, and thereafter in 1899 an action was brought to determine the priorities and amounts of said and other users of water from said creek, and the priorities and amounts were determined by the decree in said action, B. being given a priority as of 1872 for 238 inches, and H. a priority as of 1879 for 150 inches, and B. continued to divert about one-half of said 238 inches through his 1876 ditch, *held*, that H. is not entitled to an injunction restraining B. from so diverting his water. *Hall v. Blackman*. Supreme Court of Idaho. 126 Pacific 1045.

INDEFINITENESS OF CONTRACT.

Plaintiff sued to recover money under a contract by which it was claimed that defendant agreed to purchase a water right on certain specified terms. The written contract indicated that defendant intended to purchase a water right to 1½ feet per acre per year to irrigate 10 acres of land, when the water rights purchased embraced 500 acres. The contract, however, provided that the water should be used to irrigate land specifically described aggregating 2,500 acres pro rata. It also recited that it was essential that the works be completed by April 1, 1910, so that the water might be then used for irrigation, and that defendant and those uniting with him agreed to purchase, upon completion of the works, the number of acre water rights set opposite their respective names to irrigate the "2,500 acres of land described in the contract pro rata." It also provided that the water rights which defendant agreed to purchase should be in all essential respects the same as those in a blank contract attached, but the two papers were irreconcilable. *Held*, that the contract was so indefinite and uncertain as to be unenforceable. *Pasco Reclamation Co. v. Cor.* Supreme Court of Washington. 127 Pacific 107.

APPROPRIATION.

In order to initiate the right to appropriate public waters of the state at a point upon land belonging to the state, it is necessary for the applicant to enter upon land owned by the state of Idaho for the purpose of making the necessary examination and surveys, maps, and plans required in order to make a proper application to the state engineer for a permit, and the entering upon the state lands for the purpose of making appropriation without having the right to make such entry, either by purchase or condemnation proceedings, as provided by law, would be a trespass upon said lands, under the provisions of section 1578, Rev. Codes. *Tobey v. Bridgwood*. Supreme Court of Idaho. 127 Pacific 178.

THE FARM WATER SUPPLY.

By E. G. Norton of the I. H. C. Service Bureau.

There is more poetry than pleasure in "carrying water from the spring," or any other source of supply, when face to face with the proposition of carrying enough of it for the family washing, the Saturday cleaning and scrubbing, and incidentally, the Saturday night bath supply. With dishes to wash three times a day or more, cream separator to clean, vegetables to wash, cooking, and the hundred and one other demands for water in the daily routine of the home, is it surprising that the housewife seems always to see empty water pails before her? A call on Johnnie or Willie brings the invariable complaint, "Didn't I just get a pailful?"—it may have been a couple of hours ago and mother may have carried in a dozen pailfuls herself in the meantime to avoid delay. And if father carries in an occasional pail or two, it is with a half-conscious air of having done his duty as a considerate head of the house.

This is a day of labor-saving devices, and there is nothing which will save more labor and give greater satisfaction to the country housewife and at the same time add so greatly to the comfort of the entire family as a home water works system.

There are thousands of farm homes where such systems have been installed, and there are thousands more where they no doubt would be adopted were it not that the idea has never taken practical form in the farmer's mind. If it ever did suggest itself it was as a sort of "pipe dream," and with the putting away of the pipe was dismissed as impracticable or altogether too expensive a proposition to be considered seriously.

A home water works equipment is not impracticable for any ordinary farm or village home, and the average farm owner on looking into the subject a little would no doubt be surprised to find at what comparatively light cost such comfort and saving of labor can be accomplished.

Especially is this the case where there is already a gasoline engine on the farm to do the pumping—and there are few farms of any size or pretension nowadays that do not have one of these engines. Even if an engine must be purchased primarily as a part of the house water works equipment, its cost cannot rightly be charged up wholly as a part of the expense for this purpose, as it is used for so many other purposes—sawing wood, cutting and grinding feed, spraying, turning the grind stone, operating the fanning mill, cream separator, churn, washing machine, and every other machine to which power can be applied. Conceding, therefore, that almost every farm either has or will have its engine for general purposes, the cost of an engine is hardly to be considered as a part of the cost of putting in a water works system.

There are three methods by which a farm or village home that is out of reach of a city water works system can be equipped with running water:

1. By gravity from a well or spring on higher ground.
2. By gravity from elevated tanks:
3. By means of a pneumatic tank.

The first method requires conditions rarely found. It depends on having an elevated spring or water

source near at hand, from which water can be piped down hill with pipes run into the house up to a height corresponding to the source on the hill. Obeying the natural law that makes water seek its own level, the water will rise in the pipes as high as the level from which it has been secured, and can thus be distributed throughout the house. With this system no pumping whatever is required. This is an ideal method, but the necessary conditions are not often found.

Gravity flow by means of an elevated tank is a system quite commonly used. The tank is often placed in the attic of the house, or in the hay mow, or it may be placed on a tower in the open yard. The use of the tower, however, is apt to be unsatisfactory, except where the climate is mild enough so that the water will not freeze. Where the tank is placed in the attic, danger from freezing is largely avoided by running the supply pipe along the inner wall of the house; when a tank is located in the hay mow, the pumps are in the stable and the supply pipes are run under ground to the house. As to the size of tank, a 500-gallon capacity should be large enough for a medium-sized farm, for both family and stock. Such a tank could be filled daily by running the gasoline engine from five to ten minutes at practically no cost for fuel. A 500-gallon tank in either galvanized steel or cypress can be bought for about \$10.00 or \$12.00. If only a house supply, to be located in the attic, is desired, a 150 to 200-gallon size might be large enough and even more desirable, as too great a weight would not be practicable in such a location. One of these smaller tanks could be purchased for about \$5.00. A 1,000 to 2,000-gallon tank would cost from \$15.00 to \$25.00, but with a tank of that size, located so as to avoid trouble in cold weather, a half hour's pumping with a gasoline engine a couple of times a week would furnish water for every possible use on the farm—for both family and stock, and for watering the flowering shrubs, fruit bushes, and the family garden in dry weather—by merely turning a faucet or two. It certainly sounds attractive, doesn't it?

The pneumatic tank system of supplying water for the home, is unquestionably the best and most satisfactory system that has yet been devised, though perhaps costing a little more in the beginning than the elevated tank gravity method. The outfit consists of an air-tight steel tank, a force pump, and piping to connect well to pump, pump to tank, and tank to house pipes. The tank is usually placed in the cellar, or is buried under ground and the pump may be located at the well, in the cellar, or wherever convenient.

The principle on which the pneumatic system is based is air pressure. Water is pumped into the air-tight tank and compresses the air in the tank which exerts a proportionate pressure on the water, forcing it upward in the pipes to the desired height. Some of the advantages are that, owing to the location of the tank in the cellar or under ground, the water is kept cool in summer and does not freeze in winter; also the air in the tank by oxidizing organic matter in the water, purifies the water to a considerable extent.

Any form of power can be used to do the pumping for a pneumatic system—hand power, windmill, gasoline engine, hot air engine, electric motor, etc. It

(Continued on page 89)

FROM OUR EXCHANGES.

IRRIGATION.

I remember, I remember, on the old home farm back East,
Where dry weather brought us famine, where timely rains
meant feast;
How we broke our backs a-plowing, put good money in the
field,
But never knew, for certain, what the harvest time would
yield.

I remember, I remember, how our father used to stare
Into the sky at morning—asked for rain at evening prayer,
While the mortgage knew no seasons, worked on Sundays,
night and day,
Kept up boys away from college, turned our mother's hair to
gray.

I remember, I remember, when we all were dispossessed,
And disgrace at the foreclosure drove us to the great
NORTHWEST,
Where we gazed in wide amazement at the crops raised
without rain,
By flooding fields from ditches—where we all took heart
again.

I remember, I remember, how the first crop that we raised
More than paid for all our land—father's shout, "the Lord be
praised,"
Wealth has since come every season—blessed Irrigation's art;
Father prays, no longer selfish, "Give us each a contrite heart."

GEO. M. BAILEY,
President Northwest Townsite Company.

FAKE "FIRE ADS" IN BAD.

CITY ORDINANCE OUTLAWS SCHEMES DESIGNED TO MIS-
LEAD THE PURCHASING PUBLIC.

Seattle, Dec. 17.—An ordinance prohibiting the
advertising of "fake" fire, bankruptcy, receivership or
other sales became effective here today. Under its
terms the publication of an advertisement which mis-
represents the value or quality of any commodity of-
fered for sale is punishable by a fine not exceeding
\$100. The ordinance was advocated by the advertis-
ing men of the city.—*The Town Crier*, St. Paul,
Minn.

This is a move in the right direction.

RAILWAY AND ENGINEERING LITERATURE.

THE PRIMER OF HYDRAULICS.—By Frederick A.
Smith, Hydraulic Engineer, Chicago. Published by
D. H. Anderson, 30 North Dearborn street, Chicago.
Cloth, 5x8 inches, 217 pages; price, \$2.50.

The author of this book is assistant engineer in
the department of public works, in Chicago, and in
the course of many years' work in that department
he was obliged to prepare tables, diagrams and for-
mulas suitable for analyzing various problems which
came up in connection with the flow of water in cir-
cular conduits running partially full. The conditions
here met were not covered in the text books or other
current technical literature. These tables, prepared to
meet the conditions of actual practice, have been
elaborated and embodied in this work, together with
other new matter, the idea being to collect sufficient
rules and tabular information to solve any problems
relating to the flow of water in channels of the usual
construction that are employed in municipal, drain-

age or irrigation work. The treatment begins with
fundamentals, and is presented in such style that the
non-technical reader may comprehend the subject and
intelligently analyze hydraulic problems that are
ordinarily met with. Various chapters of the book
deal with problems relating to open channels, closed
channels, pipes flowing full under pressure, subdivi-
sion of channels, and loss of head by enlargement of
channel and at the entrance to pipes. There are two
chapters relating to ditches, with tables applying to
the same. This little volume contains data or in-
formation for the complete practical treatment of
various problems, which, but for a hand book of this
kind, would involve the consultation of a number of
references.—*Railway Engineering*.

COMING BACK FROM CANADA.

Many of the American farmers who went into
Manitoba and Saskatchewan in the boom days, are
preparing to return to the United States, according to
J. B. Reisman of St. Paul, who has just returned from
Winnipeg, says the *Duluth News Tribune*.

"Coming from Canada I was told," said Mr.
Reisman, "that 80 per cent of the American farmers
who went into Manitoba and Saskatchewan, will re-
turn to their home country in another year; some of
them, in fact, are leaving now. It seems that the high
cost of living in that country has decided them to
return to America, where they can buy necessities for
less money than they can in the Dominion. The great
importation of American products into Canada is one
reason for the advanced prices.

"The Canadians recognize the fact that many of
the American farmers who went there in the boom
days are leaving."—*Bangor Independent*.

It now begins to look as if the people of the
west are fully aroused over the proposition to have
all the remaining government land ceded to the
states. Of course it will be quite a difficult matter
to get the eastern congressmen to understand our
troubles or to show an inclination to get us out of
the dilemma imposed upon us by the federal bu-
reaucrats. Whenever anything like this is pro-
posed in congress the dog soldiers in the various
bureaus set a back fire in the committee rooms
where the business is smothered without any fur-
ther ado over it. The government holds this prop-
erty in trust for the people who come within these
great commonwealths. It was never intended that
they should have the heart carved out of them and
be left with but the remnant of a carcass, but it
was designed that from these resources the man-
hood and the womanhood of each state should make
a great commonwealth and we were getting along
all right until the bureau autocracy at Washington
nosed into upset matters and put the whole propo-
sition on the bum. The recent election throughout
the Rocky mountain region should serve as a warn-
ing answer to those politicians who are smart
enough to read the handwriting on the wall.—*Field
and Farm*.

Reclamation Notes

CALIFORNIA.

Articles of incorporation have been filed by Commonwealth Land and Irrigation Company of Los Angeles, Cal. The company has a capital stock of \$500,000. Messrs. J. F. Riddle, V. Merx, G. A. LeDoux, P. P. Myhand and R. H. Mullincaux are the incorporators.

One of the largest developments planned for the Woodville section, and which is to be undertaken by Porterville capitalists, is the establishment of a 400-acre alfalfa farm near that city. Work is already under way and the entire 400 acres will be seeded to alfalfa during the coming year. Plans have been accepted for a central irrigating plant and water is already being developed. Two 7-inch centrifugal pumps and two 20-horsepower motors will be installed for watering the crop.

A warning has been issued by W. H. Holabird, as receiver of the California Development Company, against persons putting up money for locations or filings on desert lands in the Imperial valley, lying west of the West Side Main canal. Beyond that line, he states, he believes no water will be delivered. He further states that there are thousands of acres of land in the Imperial valley that can be irrigated by gravity water. These desert lands that will come under irrigation in the near future lie under the East High Line canal, now being constructed by Imperial Water Company No. 5, whose office is at Holtville, Cal.

A unique irrigation system is being installed for the Worth Water Company, formerly known as the Loma Linde, which will serve a number of orange growers near Porterville. Four wells have been driven, with a combined production of 70 inches of water. They are connected with a tunnel sixteen feet below the surface of the ground. A central centrifugal pump will take the water from the four wells and run it into a surface reservoir. From this reservoir two 8x10 triplex pumps will force the water through 4,900 feet of pipe to the foothills back of the orchards, where the central distribution tanks have been placed nearly 200 feet above the pumps. The cost of the system is approximately \$10,000.

J. E. O'Donnell and M. B. O'Farrell of Los Angeles, will drill six wells at once on their land on the Palomares ranch near Oceanside.

The Kern County Land Company of Bakersfield will prepare 700 acres of land at Shafter, eighteen miles from Bakersfield, for sub-division and sale. A number of wells will be put down and electricity will be used for pumping. A townsite will be laid out.

A Los Angeles syndicate, composed of Messrs. Edward M. Fowler, W. H. Hollingsworth, James H. Wagner and Robt. Marsh, is preparing to establish an irrigation system upon several large tracts of land in the Linda Vista mesa, north of Mission Valley, aggregating 10,000 acres. It is planned to put down a number of artesian wells to secure water for irrigation.

Suit to recover lands granted by congress in March, 1901, to the Pine Valley Consolidated Com-

pany, for reservoir and irrigation purposes, has been filed by the U. S. government. The government charges that the company has not carried out the terms of the grant.

At a cost of approximately \$350,000, the Fontana Company of Los Angeles, has completed what is said to be one of the finest and most comprehensive irrigation systems in the entire Southwest. The system waters about 4,000 acres of land lying adjacent to the town of Rialto. The water developed from the flow of Lytle creek is valued by experts at \$1,000,000 and is declared to be more than ample to irrigate the tract.

Articles of incorporation have been filed by the Montalvo Mutual Water Company of San Buenaventura, Cal. The capital stock of the company is given as \$40,000. George Cook and J. C. Daly of Ventura, E. S. Hall of Nordhoff, W. W. Steele of Montalvo and R. B. Haydock of Oxnard are the incorporators.

The diverting dam at Willow Bar, built by the Oakdale and South San Joaquin districts for turning the water of the Stanislaus river on the plains around Oakdale, making that town the center of 300,000 acres of irrigated land, has been completed. This dam is 80 feet high, 300 feet wide and is built of reinforced concrete.

Articles of incorporation have been filed by the Oro Loma Irrigated Farms. Capital stock of the company is given as \$10,000; subscribed, \$30; shares, \$10 each. Directors of the new company are W. M. Sims, J. W. Marshall and L. R. Young. The principal office of the company is at San Francisco.

Churn Creek valley, situated in Shasta county, lying about halfway between Redding and Anderson, will be irrigated next season, by a canal eight feet deep. The valley contains about 3,800 acres of fertile land. The plan is to have a pumping plant at an intake in the Sacramento which raises the water to a point that will cover the entire valley.

The city of Santa Paula has filed a complaint against the Santa Clara Water and Irrigating Company, and against the Interurban Land Company. These two corporations are engaged in the irrigation business and carry water through the city of Santa Paul in an open ditch. The city authorities complain that the ditch is unhealthful, and ask that the companies be compelled to carry the water through the city of Santa Paula in submerged pipes.

Articles of incorporation have been filed by the Rush Creek Mutual Ditch Company of Los Angeles. Capital stock of the company is placed at \$30,000. Messrs. O. Oliver, F. D. Hager, W. D. Hager, E. D. Silent and A. H. Swallow are the incorporators.

E. C. Sterling of Los Angeles, has acquired controlling interest in the Fullerton Domestic Water Company of Fullerton, Cal., and will make extensive improvements in the plant, including a large cement reservoir, new iron pipe mains, etc.

The Claremont Domestic Water Company of Claremont, has filed articles of incorporation, with a capital stock of \$100,000. L. N. Smith, G. S. Summer, E. C. Norton, F. N. Thomas and L. T. Gillett are the incorporators.

A contract for the making of 30 miles of 16-inch steel irrigation pipe has been given the Western Pipe

and Steel Works of Richmond. Most of this pipe will be used in the Sacramento Valley.

The Northern California Power Company has signed a contract for the furnishing of 20,000 horsepower for the purpose of reclamation and irrigation of a vast tract of land south of Chico.

Articles of incorporation have been filed by the First Thorne-Hill Mutual Water Company of Corcoran. The capital stock of the company is \$50,000. J. J. Hill, W. F. Thorne and P. B. Plumb, all of Corcoran, are the incorporators.

An irrigation district is now being formed to reclaim 20,000 acres of desert land located on the north side of the Mojave river along the Salt road from 15 to 20 miles east of Daggett, and only 160 miles from Los Angeles. The underflow, as well as the surface flow, of the Mojave river were filed upon two years ago, and since that time continuous work has been done making surveys, laying plans and getting ready for the work that is about to be commenced. All of the government land within the proposed district has been filed upon, mostly under the desert act, while the lands owned by the Southern Pacific Railway Company have been purchased by the Mojave River Land and Water Company, a corporation of which J. Lamb Doty is president; L. M. Holt, vice-president; F. C. Finkle, consulting engineer.

COLORADO.

The Otero irrigation district held its annual election recently for one director to serve for a term of three years. There were two applicants, Frank Taylor of Pueblo and R. W. Norton of La Junta. Mr. Taylor was elected.

A meeting was held recently by land owners in the vicinity of Benton to consider the enterprise of H. L. Brandon to bring water from the Purgatoire river to irrigate their lands. The survey of the reservoir and ditch was exhibited and a full explanation of the system and cost of construction was gone over by Engineer Hansford. After full consideration, those present, representing 9,000 acres of land, passed a resolution to contract for water. When watered the land will be worth \$100 to \$150 per acre.

Land wanted by the government for irrigation rights of way will be taken at once hereafter, according to a rule adopted by Federal Judge R. E. Lewis. The new rule was adopted recently in the case against Mrs. E. C. Beaver of Montrose county who asked \$2,000 an acre for land for which the government offered \$600. Heretofore it has been necessary to agree on the price of land before it could be taken by the government. Under the new rule the land will be taken and the price determined later.

TEXAS.

Articles of incorporation have been filed by the Las Vegas Irrigation Company of Las Vegas, Dimmitt county. The company is capitalized at \$25,000. The incorporators of the company are J. A. Pierce of Franklin, Tenn., Eli Howell and H. H. Radley of San Antonio, Texas.

Engineer's reports have been completed that are very favorable to the proposed dam to be built on the Colorado river for the storing of flood water to be distributed for irrigation purposes through that section. Engineer N. G. Simpson estimates that at a cost of \$785,406.06 all expenses of this project may be

covered. It is estimated that 9,400 acres will be necessary for the reservoir and dam site; the main canal will be forty miles long, with thirty miles of main laterals. The main canal will be 60 feet wide and about 8 feet deep. The irrigable area proposed covers 7,500 acres of land; all well situated for irrigation at a minimum cost, and the soil is specially adapted for irrigation.

C. W. Hahl of Houston Tex., and St. Louis associates, have purchased 16,400 acres of land in the Rio Grande valley for \$615,000, and propose development by construction of an irrigation system to prepare the property for agriculture.

One of the largest pecan groves in the world is to be planted on the lands irrigated by the great Medina dam. The project will be financed by New York and London capitalists, and 121,000 pecan trees will be planted. The trees will be the soft-shelled varieties. This valley is famed for its pecans.

Permit to do business in Texas has been granted to the Garwood Irrigation Company of Hamilton, Ohio, with a Texas office at Garwood. The capital stock of the company is \$100,000.

Articles of incorporation have been filed by the Atacosta Valley Irrigation Company of Pleasanton. The company is capitalized at \$120,000. The incorporators are W. A. Coughran, J. W. Ormond, John W. Hunt, Henry G. Martin, William O'Brien of Pleasanton and W. L. Dunne of San Antonio. This company is developing 4,000 acres of land near Pleasanton.

The San Antonio Irrigation Company has increased its capital stock from \$6,515 to \$50,000.

Articles of incorporation have been filed by the Rio Grande Irrigation Company of Eagle Pass. The company is capitalized at \$5,400. The incorporators are L. C. Debona, William M. Cummins and Pedro Rodriguez, all of Eagle Pass.

The Holland Dam and Irrigation Company of Cotulla, has filed an amendment decreasing its capital stock from \$23,000 to \$3,548.

UTAH.

For the past month a party of surveyors has been at work on the east side of Utah lake, and it is presumed that they are collecting data for a Los Angeles company which is considering the practicability of diking the lake on the east side. This will reclaim four or five thousand acres of rich land south of Provo, which is covered with water, and make it available for cultivation.

Representatives of the Oasis, Melville and Deseret projects are seeking for permission to strengthen the Sevier river dam, through which it is claimed 50,000 acres of additional land can be put under irrigation. Owing to some legal points involved, final action on this matter has been deferred indefinitely.

The land board has ordered the resumption of work on the Piute project canal which is to be strengthened and extended two miles further into an unclaimed section of the country.

Assurance has been given by the state land board that the state will give all possible aid to the project contemplating the reclamation of 60,000 acres of choice farm lands in Uintah county. The project is being promoted by the F. H. Lott Carey Act Project Company. Representatives of the company have laid

their plans before the state land board and explained that they intend to spend \$500,000 for a reservoir and canal system.

Articles of incorporation have been filed by the Clear Lake Irrigation Company; principal place of business Clear Lake; capital stock, \$300,000; shares, \$25 each.

Reports from the Utah Lake Irrigation project state that the work on same is rapidly nearing completion, and that 20,000 acres of the best land in Salt Lake and Utah counties will be brought under irrigation next season. The principal office of this company is located in Provo; the land to be reclaimed lying near Saratoga Springs.

The articles of incorporation of the Hyde Park Irrigation Company have been filed with the county clerk. The company is capitalized at \$36,000, and there are 3,000 shares issued; 1,400 of these are shares of Class A, and have a face value of \$20, while the remaining 1,600 are Class B, and are of the value of \$5 each. The principal office of the company is located at Hyde Park, Cache county.

The Logan and Northern Irrigation Company, principal place of business Logan, has filed articles of incorporation. Capital stock \$32,790; \$10 each. The following officers have been elected: Olaf Cronquist, president; Jas. McNeil, vice-president; L. C. Peterson, secretary and treasurer.

WASHINGTON.

W. T. Clarke of Wenatchee, who recently refused an offer for his irrigation and land holdings in the Wenatchee Valley, has made a deal whereby all of his

associates retire and turn over to him personally all their properties east of the Columbia river. They take all the mortgages and Clark assumes the obligation of making \$50,000 worth of improvements in the Wenatchee canal system. The money will be spent in lining tunnels and building new flumes and a new bridge across the Wenatchee river to convey two pipe lines. This structure removes for all time the shortage of water from which the valley has suffered the past two seasons. An additional \$100,000 will be spent on the system within two years.

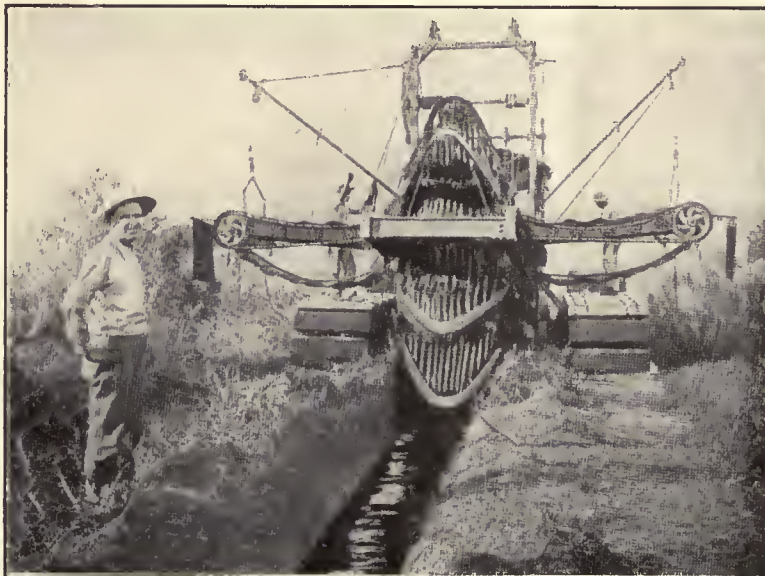
F. M. Welles, of New York City, at one time physician in charge of Blackwell's Island, has purchased a large tract of land near Walla Walla. Water for irrigation purposes will be taken from the Touchet river, which flows through the tract.

The Modern Electric and Water Company is engaged in the manufacture of several thousand feet of cement pipe, to be used in the spring in the extension of the irrigation system at that place.

To forestall the necessity of being compelled to have their land watered from a proposed irrigation district in the valley of the White Bluffs country, contracts are being let by several owners of land in the proposed district for the digging of wells on their ranches. A number of private irrigation plants will be installed by individual owners and a considerable acreage planted to alfalfa and fruit.

The Icicle Canal Company of Wenatchee, has sold its holdings to a new company composed of George and C. H. Black, both of Seattle, and L. W. Horton and Walter M. Olive, both of Wenatchee.

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The Icicle Canal Company has completed about forty miles of irrigation system, extending from Icicle creek to Monitor, and affording water for 6,000 acres of choice orchard land in the heart of Wenatchee valley. About four miles of canal remain to be completed and work on the extension will be begun early in the spring.

The work being done by the Reclamation Service at Lake Kachees, is practically completed. The level of the lake will be raised 30 feet to impound storage water for the high line and other irrigation projects in the lower valley. The big dam at the foot of the lake is practically finished.

The Cascade Lumber Company and other creditors of the Union Gap Irrigation Company of North Yakima, have asked for a receiver for that concern. The Union Gap Irrigation Company, which built one of the first of the big ditches in Yakima county was incorporated for \$4,000. It began work in 1904, and in two years completed 31 miles of canal at a cost of \$50,000.

The North Coast Irrigation Company of Seattle, will reclaim a large acreage near Ritzville, in which town they have recently opened an office. Water for irrigation purposes will be pumped from Cow creek.

At a recent meeting at Ellensburg, it was practically decided to form a \$600,000 irrigation district, to embrace 17,000 acres of land under the Cascade ditch. The plans contemplate extensive improvements of the present system such as a tunnel through the hill to replace the wooden flume. Practically all the landholders under the Cascade ditch are stockholders in the canal and said to be willing to form a district, which would mean the placing of collections of water money fees in the hands of county commissioners.

An engineering project which will provide for the irrigation of 50,000 acres of land in northeastern Washington, and save another large area from annual devastating floods, has been undertaken by the Arcadia Orchards Company of Spokane. The undertaking involves the expenditure of \$500,000 in construction work and will open the way for an additional expenditure of approximately \$2,000,000 in the development and irrigation of raw timber land, making it the largest private reclamation undertaking in the history of the state of Washington. The project now in hand is to lead the excess waters from the Kalispel river and other Pend Oreille county streams through the Kalispel mountains by means of an 18-mile flume and a mile tunnel to Deer Lake and Loon Lake, and thence to the land in the Arcadia district. Preliminary work has been under way for two years and the ground has been completely covered by engineers, according to officials of the orchard company. Water rights have been obtained on the waters of Kalispel river and other streams in that locality, and the work will go forward with all possible speed. It is expected that the project will be completed within three years.

MISCELLANEOUS.

Maney Bros. the contractors on the second unit of government reclamation work at Klamath Falls, Ore., bid fair to get one-third of their work done this sea-

son. If the fair weather continues they will finish from thirty to forty per cent, and will complete the whole project much ahead of the scheduled time. They expect to have the Nuss and Griffith laterals ready for use for the irrigation season of 1913, and while they have much work done on the North and South Poe Valley canals they will not be able to turn them over in time for 1913 water, unless it be late in the season.

The United States Department of Agriculture has informed the Oregon State Agricultural college that the government will co-operate with the state of Oregon in establishing and maintaining an irrigation experiment and demonstration farm in Klamath county. This forty-acre tract will probably be located on the government land near Klamath Falls.

The contract which the state of Idaho has with the North Side Twin Falls Land and Water Company will not be cancelled as requested by the settlers on the north side tract, who alleged that the company did not comply with the terms of its contract with the state, but instead the state land board has ordered the company to impound for delivery 170,000 acre feet of water for use of the settlers in irrigating their land.

Among the late permits granted for the use of water by the state engineer's department of South Dakota, are the Stanley County Abstract & Loan Company of Fort Pierre, to appropriate water from White river, for the irrigation of 328 acres of land in the southwestern part of Stanley county. To Wm. Haviland of Wasta, to take water from White river to irrigate 182 acres of land, and to Wm. Richards of Vivian, to take water to irrigate 124 acres.

The Secretary of the Interior has authorized the Director of the Reclamation Service to execute contract with the Wheeling Mold and Foundry Co., of Wheeling, W. Va., for furnishing five high pressure gates for the Arrowrock dam, Boise irrigation project, Idaho. The price of these gates, including freight, is \$29,059.20.

FARMERS OF FORTY CENTURIES.

"Farmers of Forty Centuries or Permanent Agriculture in China, Korea and Japan" by F. H. King, professor of agricultural physics in the University of Wisconsin, 1888-1901, and chief of the Division of Soil Management, U. S. Department of Agriculture, 1901-1904, is an authoritative and well gotten up publication covering the subject of agriculture in those countries. It is the only work of the kind that has ever come to our attention. It contains valuable information, and is written in such form as to make it a valuable text-book, and it is both entertaining and interesting.

This book is a fitting climax to the life of F. H. King of the University of Wisconsin. In it he placed the best efforts of his life, and the work should be in all libraries where agriculture is studied.

This work contains 441 pages with 248 illustrations, largely from photographs by the author. The book is published by Mrs. F. H. King, Madison, Wisconsin.

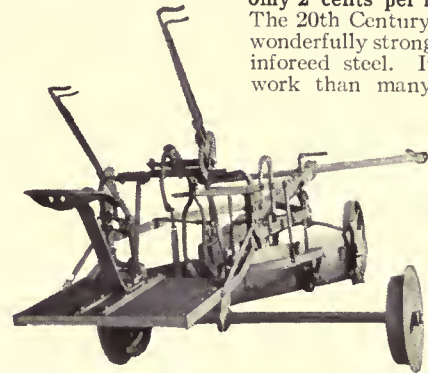
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HOW JONES DID IT.

Now, Jones was not a spendthrift, a plunger or an idiot, although a lot of his neighbors had that opinion of him. He was just a plain, ordinary, two-dollar a day laborer with a lot of ambition and good common horse sense.

He had toiled for a contractor for somewhere in the neighborhood of four or five years. He was the contractor's right-hand man and could be trusted with the men and with the work. He knew how to do the work and he did it well until one day his dreams, his ambitions and his desires got the better of him and he quit, giving the contractor absolutely no reason.

For two days and a goodly part of two nights he thought, he figured and then walked into the Jonesville Bank and asked for a loan of \$150. Now, Jones was honest and a hard worker and after a little persuasion he got the money. He walked over to the post office, addressed a letter to the Cement Tile Machinery Company, Waterloo, Iowa, and enclosed an order for a Helper Concrete Mixer.

In a few days the mixer arrived at the depot. Jones was there and so was half the town, for this new machine was as unusual in Jonesville as a circus and everyone turned out to see what the machine was and what it would do.

It was then and there that some of Jones' good neighbors passed the remark that Jones was more or less of a spendthrift and an idiot and prescribed the insane asylum for him within a few short months, but Jones took it all in good grace and hauled the machine up the street to his home.

This new adventure of Jones' was about as well known and as much talked about as Harry Law, who had been recently elected to Congress, but why should Jones care? He wanted popularity, he wanted advertising and this he was getting in a full measure.

Now, Jones has a good wife and she shared his ideals, his ambitions and oftentimes made suggestions that were to his benefit and in this particular case it was she that advanced the idea of painting a banner telling the people of Jonesville just what this machine was expected to do. In the next day or so Jones tacked up a large banner on the bill-board in the Jonesville post office which read something like this: "John Jones has recently purchased a Helper Concrete Mixer, the latest innovation in the mixer world and is now ready to build your cement sidewalks, your silos, corn cribs, water tanks, etc., all work done with the latest and most improved methods and I guarantee satisfactory work and the lowest prices."

Well, the banner did the work and Jones got work, and then more work. In a short time he hired a man to help him. A little later he hired a second man and by the end of the year Jones was employing six men and also doing his level best to keep up with the orders he had on file.

Jones was no longer just plain Jones. He was Contractor Jones. He chummed with the banker and was looked upon as one of the real business men of the town. His time was no longer worth \$2.00 a day but it was worth \$10.00 a day, and why, simply because Jones had made use of his ambitions, his ideals and his common horse sense. He had taken hold of

his nerve and was employing the latest methods to do his work, enabling him to do it cheaper and better than the fellow who did everything with old, worn-out ideas and methods. So Jones got the work. He threw away the old methods, he discarded hand power and bought gasoline to make the wheels go and make profit for him.

It is only two years since Jones made his start, but a glance at the rating book will show you his assets in four figures.

Now, the moral to this tale, its message to you, is to pick up your nerve, grasp your opportunities, discard the past and build up the future with modern ways and modern methods. In other words strain a point just once and lift yourself high up out of the rut in which you have been plodding.

HENRYLYN IRRIGATION DISTRICT INJUNCTION.

In the case of the *United States v. Henrylyn Irrigation District et al.* (U. S. District Court Colorado), the Government asked for an injunction to prevent the irrigation district from continuing the construction of canals and tunnels for the irrigation district within the Arapahoe and Pike National Forests, Colorado.

The defendant had begun the construction of a tunnel before receiving approval of its application for right of way therefor. The Irrigation District claimed that because the Secretary of the Interior suspended action upon all applications involving the diversion of the headwaters of the Grand to the Eastern Slope of the Rockies, the Courts had the power to authorize the continuance of the work in the National Forest. The Government claimed that the diversion of the waters would interfere with its prior rights for the diversion of water for the Grand Valley Project under the Reclamation Act.

The court held that the approval of the executive branch of the Government is necessary to the acquisition of right of way over a national forest; that injunction is a proper method to prevent occupation of right of way in a National Forest without such approval; and that the failure or refusal of the Executive Officer charged with the approval of such applications does not justify the prosecution of the work without such approval, nor preclude the maintenance of a bill in equity to prevent such building in advance of approval. The court held that the remedy for any wrong which might result from the failure of the Executive Officer to act was not in the courts but in Congress.

F. E. MEYERS & BRO. ISSUE CALENDAR.

F. E. Myers & Bro. of Ashland, Ohio, inform us that they have just finished mailing 40,000 calendars to dealers, handling Myers Pumps, Hay Unloading Tools, etc., in this and foreign countries. The calendar is a large one, and is of the style used by F. E. Myers & Bro. for over thirty years, making changes from year to year in the style of heading and in the addition of new goods. Many dealers use these calendars for ready reference, often selling goods to their customers direct from it.

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Condensed Table of Contents.

Article I.	General Properties of Matter.
Article II.	Algebraic Principles.
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Article XX.	Ditch Tables and Their Applications.
Article XXI.	Flow Measurements.
Article XXII.	The Use of Logarithms.

Tables.

Fourteen tables giving the factor C for all cases of channels for a coefficient of roughness; n varying from .008 to .050, inclusive, for channels having a hydraulic radius from .01 ft. to 900.0 and for slopes varying from 0.1 to .000023, thus practically covering every possible condition.

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Table of Hydraulic Elements of Composite Section.
Table of Areas and Circumferences of Circles.
Table of Hydraulic Equivalents.
Table of Weights of a Cubic Foot of Various Substances.
Conversion Table of United States and Metric Measures and Weights.
Table of Squares, Cubes, Square Roots and Cube Roots.
Table of Logarithms.
Table of Natural Sines and Cosines.
Table of Natural Tangents and Cotangents.
Conversion Table. millions of gallons in 24 hours in other units.

Table of sizes of pipes or cylindrical conduits required for the flow of given quantities of water at given velocities.

Most all of these tables have been originated and computed by the author and have been checked in practical work and found to be correct, so that the tables alone will be worth many times the cost of the book.

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(Continued from page 76)



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Colorado land, which now produce valuable crops and make good livings for many thousands of people, would revert to the desert condition. And does anyone think the state of Colorado has no interest in defending a suit like this? Is it fair to say: 'Let the ditch companies defend their own rights?' These ditch companies are operating under the laws of Colorado, and are using the resources which the state of Colorado has permitted them to use, and has assured them of their right to use. It would seem that the state was under heavy obligation to protect these people against attacks from the outside.

"The ditch companies and land owners in the Arkansas valley have to date expended something like \$5,000 in the defense of this case, and it has only begun. It is to be hoped that the nineteenth general assembly will see fit to pass an appropriation bill which will be free from the defects which forced the Supreme Court to invalidate the appropriation made two years ago."

We Duplicate all Infertile Eggs. White and Columbian Wyandottes, Single Comb White Leghorns, and Light Brahmas. We use trap nests. In business for 30 years. Brahma eggs, \$3 for 15; \$5 for 30. The other varieties \$2 for 15; \$5 for 50, \$10 for 100. Address

Michael K. Boyer, Box 18, Hammonton, New Jersey

Arid Agriculture

ANYONE interested in farming or in the West should have the book entitled ARID AGRICULTURE.



Prof. B. C. Buffum

It is as important to the western farmer as a horse or a plow and costs less.

With all your getting, get understanding of how to do western things in the correct western way.

This book is used as a text-book in some schools and has been adopted by the Wyoming Board of Education as required reading for teachers.

Reading ARID AGRICULTURE will give you pleasure and help you make money.

We have never heard an adverse criticism of this book. It discusses:

1. The Arid Region
2. Dry Farming
3. Irrigation Farming
4. Western Crops
5. Crop Destroyers
6. Live Stock
7. Building a Western Home

Chapter XXVI tells how to select a western farm.

Thirty Chapters. Many Illustrations. Bound in Cloth and Gold.

If you think ARID AGRICULTURE is not worth the price, send it back and we will refund your money. Let us send testimonials.

Price, postage paid to your address, \$1.50

Order from B. C. BUFFUM, Worland, Wyo.

Books on Irrigation and Drainage

The *Irrigation Age* has established a book department for the benefit of its readers. Any of the following named books on Irrigation and Drainage will be forwarded, postpaid, on receipt of price:

Irrigation Institutions, Elwood Mead.....	\$1.25
Irrigation Engineering, Herbert M. Wilson.....	4.00
The Primer of Irrigation, Anderson.....	2.00
Irrigation and Drainage, F. H. King.....	1.50
Irrigation for Farm and Garden, Stewart.....	1.00
Irrigating the Farm, Wilcox.....	2.00
Practical Irrigation, Aug. J. Bowie.....	3.00
Practical Design of Irrigation Works, W. G. Bligh	6.00
Irrigation (as a branch of engineering), Hanbury	
Brown	5.00
Earth Slopes, Retaining Walls and Dams, Chas.	
Prelini	2.00
Road Preservation and Dust Prevention, Wm. P.	
Judson	1.50
Practical Farm Drainage, Chas. G. Elliott.....	1.50
Drainage for Profit and Health, Waring.....	1.00
Farm Drainage, French.....	1.00
Land Drainage, Miles.....	1.00
Tile Drainage, Chamberlain.....	.40
Cement Pipe & Tile, Hanson.....	1.00
Arid Agriculture, B. C. Buffum.....	1.50

The Irrigation Age Company,

30 N. Dearborn St., Chicago, Ill.

(Continued from page 79)

is a safe guess, however, that any one who is interested enough in labor saving to install a water system is not going to do the pumping by hand and is too intelligent to have expensive hired labor do it. Wind-mill power requires a tank large enough to hold at least a three days' supply; otherwise lack of wind may keep the water system out of commission a good share of the time. In some cases the electric motor, hydraulic ram, or other special forms of power may be the most practical but for the average farm, for average conditions, gasoline engine power gives by far the best all-round satisfaction. As a pumping engine and all-round source of power for the farm work, the gasoline engine has many advantages. It does not require the services of a trained engineer. Any man of ordinary intelligence can learn to run it in less than a day. It is light in weight and can be easily moved from one place to another as the work requires. It can be started in a few seconds and will run all day without any attention whatever. It cannot possibly blow up and there is no danger of fire. It is cheaper than hand labor—if a pint of gasoline costing two cents can be made to do the work it takes a man eight hours to do, the gasoline should be made to do it.

With these facts in mind, no farmer needs to be afraid to invest in a good gasoline engine, if necessary, to do his pumping. If he gets a good one, he will get his full money's worth aside from the pumping proposition, and, with power furnished, the rest of the expenses for a water system will not be especially heavy.

Grab's Automatic Foot Scraper

"The Housewife's Best Friend"



Over
1,000,000
Sold

Price
One
Dollar

Grab's Automatic Foot Scraper is the only device which cleans bottoms and sides of shoe in one operation. It instantly fastens to door step or any handy place, and keeps all mud, snow, dust and dirt out of the house. Has ten parallel plates for scraping soles and two stiff bristle brushes, which clean sides of shoe without injury to the finest leather.

AUTOMATICALLY ADJUSTS ITSELF

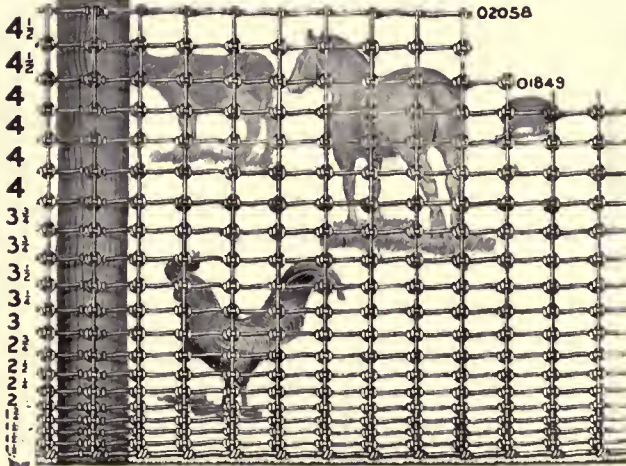
to any size shoe. Handsomely enameled. Is very neat. Can be rotated and swept under. *Illustrated Descriptive Folder Free. If your dealer can't supply you send order to*

Victor M. Grab & Company

Dept. 161 Ashland Block :: CHICAGO, U. S. A.

PEERLESS STOCK and POULTRY FENCE

SOME STYLES THAT ARE ESPECIALLY ADAPTED TO THE REQUIREMENTS
OF THE ALL-AROUND FARMER



- 020 8. 20 bar, 58 inch, heavy poultry and stock fence. Top and bottom No. 9, filling No. 12. Crossbars 13 inches apart.
2058. Same as above, except crossbars are 12 inches apart.
01849. 18 bar, 49 inch heavy poultry and stock fence. Top and bottom No. 9; filling No. 12. Crossbars 6 inches apart.
1849. Same as 01849 except that the crossbars are 12 inches apart.

**FOUR MOST EXCELLENT STYLES
FOR THE GENERAL FARMER**

These styles are close enough in the mesh to turn poultry and at the same time is heavy enough to turn all kinds of stock.

Make good fences for orchards, gardens and lanes where a close-mesh fence is necessary and where stock will be turned against them.

A stiff stay style, the crossbars being attached with the PEERLESS non-slip knot, making a stiffer, more rigid fabric than can be secured by any other style of construction.

Open Hearth Steel Wire, heavily and evenly Galvanized in a special way, giving high rust-resisting quality.

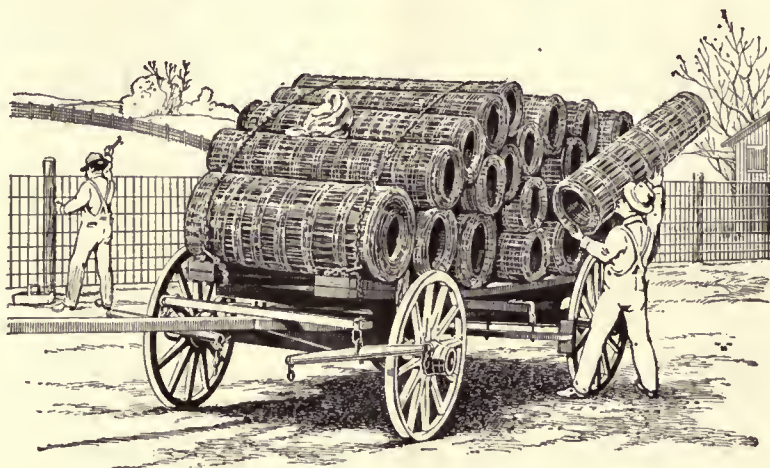
Send for free catalog, describing full line of fencing and gates.

Peerless Fence Co. 274 Michigan St. Adrian, Mich.

An Unfinished Story

REGARDING

I H C Wagons



A workman in an I H C wagon factory was explaining the various stages of wagon construction to an interested visitor. He picked up two pieces of long leaf yellow pine, which to all appearances were sawed from the same board, and asked the visitor to notice the difference in the weight of the two pieces. The lighter piece, he explained, was kiln-dried. The heavier piece was air-dried and much more thoroughly seasoned. It had retained the resinous sap which adds strength and toughness, while in the kiln-dried piece of lumber this sap had been drawn out by the too rapid application of heat.

Every Stick of Lumber Used in I H C Wagons Is Carefully Selected Air-Dried Stock

Here was something to think about, reasoned the visitor. He asked for a test as to the relative strength of the two pieces of wood. The air-dried piece held up under nearly double the weight under which the kiln-dried piece of lumber broke. The workman explained how the comparative life of air-dried and kiln-dried lumber has about as great a difference.

To the eye there was no difference between these two pieces of lumber, but when put to the test there was a vast difference. So it is throughout the construction of the I H C wagons. They are not built simply to look strong, but are built for real strength, light draft, and satisfactory service.

After seeing the care used in the construction of every part of an I H C wagon, the visitor left his order for two I H C wagons and asked: "Why don't you let people know of the great care used in selecting material and in constructing I H C wagons, and that wagons that look alike do not always give an equal amount of service?"

This is what we have been trying to do, but we cannot tell it all in one short advertisement.

For full information and literature on I H C wagons, address

International Harvester Company of America
(Incorporated)
Harvester Building **Chicago U S A**

BOSTROM'S FARM LEVEL

has been on the market nearly **30 years** and the sales get bigger every year.

We are proud of that record, and as the

BOSTROM IMPROVED**FARM LEVEL****Price \$15**

which has **Telescope** enabling you to read the Target over 400 yards away, is the most simple, accurate, durable and complete outfit ever made for

Irrigating, Ditching, Tile Draining, Etc.,

Many of the largest hardware dealers from the Atlantic to the Pacific now carry it in stock.

Write today for description of Level and give name and address of your local hardware dealer.

Bostrom-Brady Manufacturing Co.,

119 Madison Avenue, Atlanta, Ga.

VICTORIA

Australia, Bids for Farmers

31½ Years to Pay for a Home. Finest of Irrigated Lands Offered on Most Liberal Terms.

The Victorian government during the past two years has outlined an enormous irrigation plan, which places on the market as fine lands as can be had anywhere with ample water supply.

These lands are capable of producing citrus fruit and apples in the same orchards. Wheat, corn and alfalfa are staple crops. Dairying a very successful industry. Lands are now offered to settlers at prices ranging from \$30 to \$100 per acre, and allows 31½ years for payment of purchase price. Excellent climate resembling California.

Reduced steamship passage one way or return. American visitors who recently inspected these lands are wonderfully impressed. For particulars call or write Mr. P. T. A. FRICKE, Government Representative from Victoria, c/o Peck-Judah Co., 687 Market St., San Francisco.

Ditching and Sub-Soil Plow

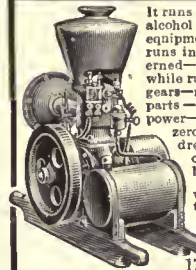
This plow will save you more money than any other implement on your farm.



Send for Descriptive Circular and Prices

LARIMER COMPANY, EOLA, ILLINOIS

20 Reasons Why You Should Investigate the SANDOW Kerosene Stationary ENGINE



It runs on kerosene (coal oil), gasoline, alcohol or distillate without change of equipment—starts without cranking—runs in either direction—throttle governed—hopper cooled—speed controlled while running—no cams—no valves—no gears—no sprockets—only three moving parts—portable—light weight—great power—starts easily at 40 degrees below zero—complete, ready to run—children operate them—5-year iron-clad guarantee—15-day money-back trial. Sizes 2 to 20 H. P. Send a postal today for free catalog, which shows how Sandow will be useful to you. Our special advertising proposition saves you one-half cost of first engine sold in your country. (167)

Detroit Motor Car Supply Co.
178 Canton Ave., Detroit, Mich.



You Could Do It Too, in the Fertile Northwest

One man made a bountiful living for his family (he has 11 children) and put \$2,385 in the bank as the result of the season's yield from his 40 acres of irrigated land in this productive country. This is not cited as an exceptional case. The "PROSPERITY STATES OF AMERICA" is the name we apply to Wisconsin, Minnesota, North Dakota, Montana, Idaho, Washington, Oregon, along the busy lines of the

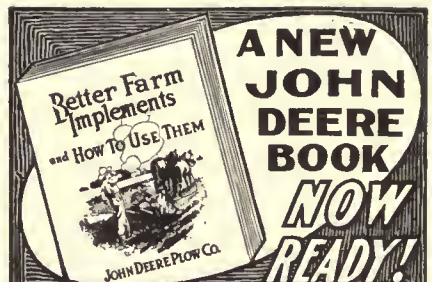
Northern Pacific R'y

To locate along this line is to assure yourself of fertile soil, nearby markets, quick transportation, good neighbors, good schools, progressive communities and increasing land values. **Investigate now!**

Ask for free descriptive literature about the state that most interests you. Let us help you to locate in the Fertile Northwest where you will prosper. Write today

Low One-way Colonist and Round-trip Home-seekers Excursion Fares effective in Spring—Ask for information as to dates and rates.

L. J. BRICKER, General Immigration Agent
A. M. CLELAND, General Passenger Agent
ST. PAUL, MINN.



A NEW JOHN DEERE BOOK NOW READY!

- Mailed Free To Farmers

Describes and illustrates completely the latest improved farm implements. CONTAINS special articles on the care, adjustment and operation of implements, interesting to progressive farmers.

It is a big book, 9"x11" in size, handsomely printed. There will be a great demand for this new big book, so write at once.

Deere & Mansur Line of Corn and Cotton Planters, Disc Harrows and Hay Loaders.

The world's best. Gold medal winners at every exposition.

We have other beautifully illustrated special booklets. Which one do you want?

More and Better Corn—Booklet. Shows corn planters, etc.

Better Hay and How to Make It—Booklet. Shows hay loaders and rakes.

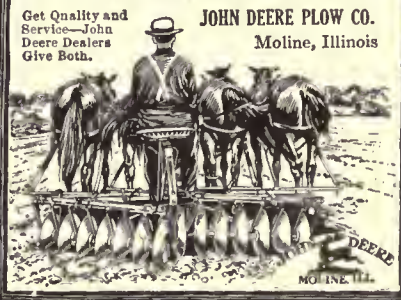
Alfalfa: Its Seeding, Culture and Curing—Booklet. Shows alfalfa cultivators, seeders, etc.

Bigger Crops from Better Seed-Beds—Booklet. Shows disc harrows, single and double action.

Tell us what implement you want to know about and which one of the special booklets you want, then be sure to ask for the big illustrated book—Package No. X 55

Get Quality and Service—John Deere Dealers Give Both.

JOHN DEERE PLOW CO.
Moline, Illinois



FAIRBANKS-MORSE Oil Engines and Pumps

For Economical Irrigation and Drainage

Mr. D. D. Daggett, of Elton, La., advised that one of our 80 h.p. Oil Engines gave continuous, 24 hour a day service at a running expense of about $\frac{1}{2}$ of what it would be with gasoline and less than half what it would be with steam. Solar oil was used for fuel and approximately 3,000 gallons of water pumped per minute, on a 45 ft. list.

Fairbanks-Morse Oil Engines

develop full power on low grade oil, kerosene or gasoline, require little attention and are very durable.

80 H.P. Fairbanks-Morse Oil Engine

Our line of engines and pumps for Irrigation and Drainage is complete. Write for Catalog No. 650XZ.

Fairbanks-Morse & Co. 900 South Wabash Avenue
CHICAGO, ILL.



"BALL BRAND" RUBBER FOOTWEAR.

The Mishawaka Woolen Mfg. Company, manufacturers of "Ball-Band" Rubber Footwear have noted a growing popularity of one-buckle and four-buckle arctics among farmers. The farmer of today still buys his pair of heavy rubber boots because he still needs them, but the increased sale of arctics seems to prove that farmers are wearing better shoes than they did four or five years ago.

The man who pays four or five dollars for a pair of good-looking shoes does not want to see them spattered with mud when he arrives in town to do his shopping, and arctics are easy things to kick off if he prefers to leave them in his vehicle. The result is neatly shod feet on the streets, warm-clad feet while driving home and shoes protected from mud and wet while putting the finishing touches on the night's work after his return.



The Brevoort

IRRIGATION DOES IT INTEREST YOU? If so, send for our SPECIAL FREE CIRCULAR, showing SAND PROOF STEAM. IRRIGATING AND DRAINAGE PUMP. No Engine required with this pump

Sand on either outside or in cannot injure them. Will raise and force water, sand and gravel any distance required.

Saves fifty per cent of fuel.

Most economical irrigating and drainage pump to both install and operate now on the market. Will work submerged if required.

Has given 16 years of satisfaction to the largest concerns in America.

STANDARD MACHINERY CO., Fisher Bldg., Chicago, Ill.



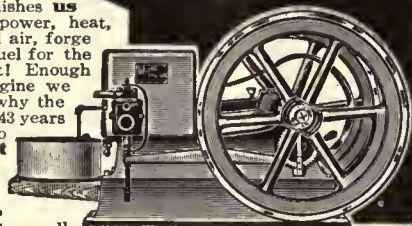
Because

we have an immense Natural Gas Well on our property which furnishes us absolutely free, power, heat, light, water, compressed air, forge and foundry fuel, and fuel for the test floor. Just think of it! Enough profit in itself for every engine we make. Do you still wonder why the famous **WITTE ENGINE**, for 43 years the standard of America, is sold to you at other manufacturers' cost prices.

Profit By Our Good Luck!

Share with us this immense saving and get a well tested engine—one with detached cylinder and valves, and all the improvements known to the trade today—an engine built by one firm for the past 43 years with a **REAL 5-YEAR GUARANTEE**. They run on any grade of fuel and are made in 64 styles and sizes. Write for **Free Trial Offer and Catalog**, stating size wanted.

WITTE IRON WORKS CO. 2256 Oakland Ave.,
KANSAS CITY, MO.



Use KEROSENE Engine Free!

Amazing "DETROIT" Kerosene Engine shipped on 15 days' FREE Trial, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing. No waste, no evaporation, no explosion from coal oil.

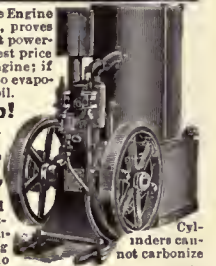
Gasoline Going Up!

Gasoline is 9c to 15c higher than coal oil. Still going up. Two pints of coal oil do work of three pints gasoline.

Amazing "DETROIT"

—only engine running on coal oil successfully, uses alcohol, gasoline and benzine, too. Starts without cranking. Only three moving parts—no cams—no sprockets—no gears—no valves—the most in simplicity, power and strength. Mounted on skids. All sizes, 2 to 20 h. p., in stock ready to ship. Engine tested before crating. Comes all ready to run. Pumps, saws, threshes, churns, separates milk, grinds feed, shells corn, runs home electric lighting plant. Prices (stripped), \$29.50 up. Sent any place on 15 days' Free Trial. Don't buy an engine till you investigate the money-saving, power-saving "DETROIT." Thousands in use. Costs only postal to find out. If you are first in your neighborhood to write, you get Special Extra-Low Introductory price. Write! (138)

Detroit Engine Works, 301 Bellevue Ave., Detroit, Mich.



GALVANIZED METAL IRRIGATION FLUME

(Newcomb Patent)

Made entirely of rust-proof, galvanized iron. No bolts or rivets used in construction. This flume is considered by experts to be the most serviceable equipment for the purpose on the market. A careful examination of the construction as shown herewith will convince those who are acquainted with irrigation conditions of its lasting quality and the ease with which it may be put together. Complete information, with prices, will be furnished on application to the



Section of Flume

KLAUER MFG. COMPANY, Dubuque, Iowa

Each a Lucky Car

By R. E. Olds, Designer

In every make an occasional car proves almost trouble-proof. No breakdowns, no repairs.

The man who gets it tells his friends he got a lucky car.

But every buyer of Reo the Fifth gets a lucky car. This is how I insure it.

How I Do It

A lucky car means simply a car built with proper care and caution. I have spent 26 years in learning all that is necessary.

I have all of my steel made to formula. Then every lot is analyzed twice to prove its accord with the formula.

Then the finished parts are tested. In every part I require over-capacity, not less than 50 per cent.

The gears are tested in a crushing machine, to prove that each tooth will stand 75,000 pounds.

Springs are tested in another machine for 100,000 vibrations.

Added Cost

I use big tires—34x4—to save you tire expense and trouble. This year, by adding 30 per cent to my tire cost, I have added 65 per cent to the average tire mileage.

I use in this car 190 drop forgings,

to avoid all hidden flaws. Steel castings would cost half as much.

I use 15 roller bearings—11 of them Timken, 4 Hyatt High Duty. The usual ball bearings cost one-fifth as much, but ball bearings often break.

I use a \$75 magneto to save ignition troubles.

I doubly heat my carburetor—with hot air and hot water—to deal with low-grade gasoline.

I use a centrifugal pump, instead of a syphon, to insure positive circulation.

I use 14-inch break drums for safety. Also seven-leaf springs, two inches wide.

1,000 Tests

The various parts of this car, during the making, get a thousand tests and inspections.

Each engine, for instance, is tested 48-hours—20 hours on blocks, 28 hours in the chassis.

Fitted parts are ground over and over, until we get utter exactness.

Each body is finished with 17 coats. It is deeply upholstered with genuine leather, filled with the best curled hair.

The electric dash lights are set flush with the dash board. Thus the car's appearance shows the care we use.

Center Control

No other car has such easy control as you find in this Reo the Fifth.

All the gear shifting is done by moving a handle only three inches in each of four directions.

Both brakes are operated by foot pedals. So the car has no levers, either side or center, to clog the way in front.

You get in this car the wanted left side drive. The driver sits close to the cars he passes. Yet you shift the gears with your right hand, just as with the old right hand drive.

Costs Me \$200 Per Car

Reo the Fifth, without these precautions, could be easily built for \$200 less. For the first few months you might not know the difference. But in years to come this skimping might cost you several times \$200.

I know this well, for I have built cars for 26 years—over 60,000 of them. I know the cause of troubles.

I save this \$200 per car by building only one model, by, building all my

own parts, by wonderful factory efficiency. And I put that saving into these extremes, to save you after-cost.

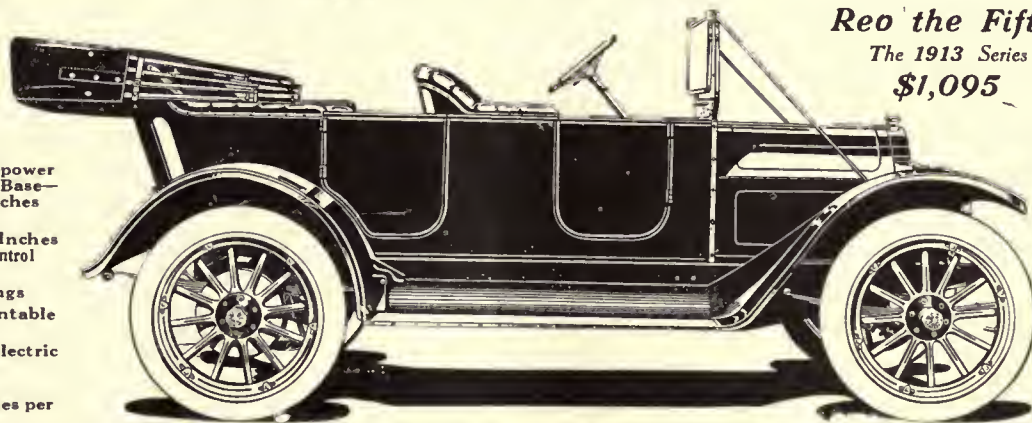
If you think that it pays to have a car like this, ask us to send you the details.

Our thousand dealers now are showing the 1913 model of Reo the Fifth. Write for our catalog and we will tell you where to see the car.

R. M. OWEN & CO. General Sales Agents for **REO MOTOR CAR CO., Lansing, Mich.**
Canadian Factory, St. Catharines, Ont.

Reo the Fifth
The 1913 Series
\$1,095

30-35
Horsepower
Wheel-Base—
112 Inches
Tires—
34x4 Inches
Center Control
Roller
Bearings
Demountable
Rims
Three electric
lights
Speed—
45 Miles per
Hour
Made with
2 and 5
Passenger
Bodies



Top and windshield not included in price. We equip this car with mohair top, side curtains and slip cover. windshield, gas tank for headlights, speedometer, self-starter, extra rim and brackets—all for \$100 extra (list price \$170).

CLASSIFIED ADVERTISEMENTS

Rate for space in our classified columns 25c per line per insertion.

FOR SALE OR EXCHANGE—IRRIGATED land in the famous Pecos Valley. Address Eugene Wood, owner, Ahilene, Texas.

GET A HOME IN NEW MEXICO, THE NEW STATE, where land is cheap and life worth living. Ideal climate. We sell no lands. Write today for book "I" with map. It's free.

State Immigration Board,
Albuquerque, N. M.

COLORADO FARM BARGAIN. 160 ACRES choice land, fenced, house and outbuildings, dandy well, pure water at 25 feet; near school and town; fine proposition for practical farmer. Only \$3,200. \$750 cash, balance to suit, 6%. F. E. Hammond, 321 Colorado Building, Denver, Colorado.

900 ACRES, NEAR DEL NORTE, 2 SETS improvements, fenced, cross fenced; all cultivated; paid up old water right. \$75 an acre, terms. Cole & Snyder, 1650 Champa Street, Denver Colorado.

80,000 ACRES, NEW MEXICO; 20,000 SUB-ject to irrigation; 10,000 underlaid with coal; excellent colonization proposition. For reports, information, write Sutton, 203 Symes Building, Denver Colorado.

ADJOINING BEST TOWN IN NORTH-eastern Colorado, a 665-acre irrigated tract, 600 acres in hay, cutting 1,000 tons yearly. Free water rights. Best section Platte Valley on Union Pacific Railroad. Owner will accept one-third cash, balance in one-half of hay crop for first five years. Price \$90 per acre. For further particulars, Glohe Investment Company, 434 17th St., Denver Colorado.

REAL ESTATE, IMPROVED IRRIGATED Farms. We offer a splendid opportunity for the investor and for the home seeker. Land bought now at Antonito will make a better living for the farmer and show a larger increase in value for the investor than any place in the world. We can sell you improved irrigated farms with the best water rights for \$50 to \$60 that will produce crops that will pay the purchase price in two years. A card addressed to the undersigned will bring you all the information you desire regarding this wonderful opportunity. W. D. Carroll, Antonito, Colorado.

DO YOU WANT INFORMATION? OUR business is giving information. Any subject, any place. We buy any article for you, tell you where to buy it. Anything you wish to know ask us. The National Information and Buyer's Agency, 1426 E. 22d Avenue, Denver, Colorado.

A WELD COUNTY BARGAIN.—I AM THE owner of a 320-acre tract, near the growing town of Ault, on the Union Pacific Railroad, with Cheyenne, Greeley and Denver convenient market places. Excellent grain land. Will sell for \$12.50 an acre. \$1,000 cash, balance in three annual payments at 6% interest. Investigation invited. One of the best and cheapest "huys" in northern Colorado. J. I. Carper, Chamber of Commerce Bldg., Denver, Colorado.

60,000 ACRES IN ONE BODY IN ARCHU-leta county. Finest stock ranch for horses, sheep or mules. Stumpage value alone \$60,000. Fine water power and irrigation possibilities, also petroleum. Price \$3.00 per acre. E. W. Merritt, 708 17th Street, Denver.

FOR INFORMATION REGARDING IRRIGATED lands in the vicinity of Saguache. Fine lands at \$10 to \$100 an acre. Only set of abstract books in county. All inquiries cheerfully answered. The Saguache County Abstract and Improvement Co., W. M. Slane, Mgr., Saguache, Colo.

IN THE GARDEN OF EDEN, OTHERWISE called Montezuma county, near Dolores, 120 acres finest soil known; raises everything. 10 acres in 4-year-old apples, raised forty bushels of wheat to acre last year, finest hay and sugar beet land. 12 foot vein bituminous coal under entire ranch. Price, \$6,500. Wonderful bargain. E. W. Merritt, 708 17th Street, Denver.

HOME AND INVESTMENT LANDS, LA Jara district. Choice irrigated lands improved, unimproved, \$45 to \$85 acre. Wilson & Rucker, La Jara, Colorado.

SEVERAL GOOD SHALLOW WATER, 160 acres and up; farms deeded and relinquishments cheap. Will make splendid irrigated farms by installing pumping plants. Plenty good range. F. J. Shindler, Eads, Colo.

FREE ILLUSTRATED BOOKLET AND price list irrigated fruit and farm lands western Colorado. Also offer interest in good irrigation project full of merit, close to Delta, in operation. Welch & Merrill, Delta, Colo.

I AM READY TO BUY ANY TRACT OF good land in the San Luis Valley for cash. I buy for cash and can sell at lowest prices. Walter N. Ickes, Alamosa, Colorado.

FINE RANCH AT DEL NORTE IN SAN Luis Valley. Close to city, Rio Grande river flows through. Fine buildings and timber, splendid stock ranch. Plenty of hay. Price, \$12,000 for 240 acres. E. W. Merritt, 708 17th street, Denver.

FOR LANDS IN THE SAN LUIS VALLEY with best water rights at prices from \$30 to \$100 per acre, see me. I have farmed 14 years and sell only good farming land. J. C. Milyard, Alamosa, Colorado.

I HAVE SOLD LAND AT MOSCA FOR 4 years. I am a practical farmer. Have 1,600 acres which I own and will sell for \$30 to \$75 an acre. All cultivated. Good water right. W. W. Saunders, Mosca, Colorado.

IRRIGATED LANDS IN THE LA JARA District, \$50 to \$60 per acre. I specialize in farm loans, insurance and have San Luis Valley irrigated lands for sale at all times. C. L. Smith, La Jara, Colo.

IDEAL STOCK RANCH IN THE FAMOUS San Luis Valley, Colorado. 1,440 acre stock ranch near Center; 6-room house, barn, corals; 10 artesian wells. Sacrifice, \$35 an acre, one-third down, balance easy. 100 choice cows and 50 head horses. Choice San Luis Valley lands \$40 an acre. J. W. Hess, Mayor of Center, Center, Colorado.

LA JARA'S LAND FIRM—NO TROUBLE to answer inquiries. An active land firm in La Jara that gives its patrons a square deal and refers to the La Jara State Bank as to its financial responsibility. Good land, perfect water rights, reasonable terms. Write for illustrated folder. Seeley & Dugan, La Jara, Colorado.

IRRIGATED LANDS IN THE PECOS valley, Texas. 25,000 acres of richest fruit and alfalfa land in country. Six cuttings of alfalfa yearly, averaging over ton per acre each cutting. Every known crop grown. The Orient Railroad, builder of irrigating system, runs to tract direct and connects with three other roads, affording direct lines to markets and Gulf ports. Ideal climate. Elevation 2,400 feet. Over one-half tract sold, 7,000 acres being cultivated. Detailed information, Wray and Trimmer, 410 Ideal Building, Denver, Colorado.

WE HAVE 20,000 ACRES OF GOOD ranch land in New Mexico, that we are dividing into ranches of from 640 acres up. Running water on most of the tracts with some timber and abundance of grass. This land will be divided so that there will be valleys on all of the tracts susceptible to irrigation which will produce all kinds of grain, fruit and 5 tons to the acre of alfalfa. The winters are mild and you do not have to feed. Parties wishing to raise mules, horses, sheep and cattle should make big money on their investment. The price ranges from \$7.50 to \$15.00 per acre, according to size and location. We also have 15,000 acres of irritable land. Price \$50.00 to \$100.00 per acre. Write us at once. The Rayado Colonization Company, 1646 Tremont Street, Denver, Colorado.

COME TO VIRGINIA

Homes for all, health for all, happiness and independence for all. Ideal climate; no malaria, no mosquitos. Write for our land bulletin which will interest you.

J. R. Meadows, Appomattox, Va.

FOR SALE—AT LESS THAN COST. A manufacturing plant engaged in the manufacture of irrigating machinery. Upwards of 20,000 feet of floor space. Six acres of ground. Equipment and buildings nearly new. Write for full particulars to Box 85, Irrigation Age, Chicago, Ill.

FOR SALE AT A SACRIFICE, 320 ACRES near Alamosa, San Luis Valley, Colorado. 320-acre relinquishment near Rocky Ford coming under irrigation, \$1,000. We have all kinds of ranch and farm and city property to exchange. Tell us what you have and we will get you what you want. If you are coming west, write us, we have some fine irrigated land and large ranches to trade for eastern property.

L. J. MOUNTZ & CO.,

Real Estate and Mining Investments,
1743 Champa Street, Denver, Colo.

FOR SALE

160 acres fine land in famous Yellowstone Valley, E. Mont. Near R. R. Very level. Under Gov't Irrigation. Good for grain, Alfalfa, Vegetables, etc. Only \$25 an acre. Will be worth \$50 soon. Owner a non-resident and not a farmer. W. B. OVERSON, Owner, Williston, N. D.

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Bayfield, the center of one of Colorado's richest and most fertile irrigated sections, was less than 10 years ago a sagebrush wilderness. Today it is a populous and thriving town. I am a practical farmer, have farmed around Bayfield 12 years; I have some fine irrigated land to sell on easy terms as low as \$30 an acre. I will locate you on government land or sell you a relinquishment. Write me today. W. R. MALOY, P. O. Box 56 BAYFIELD, COLO.

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Famous San Luis Valley

No Alkali, Good Drainage,
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Attachment with Corn Harvester cuts and throws in piles on harvester or windrows. Man and horse cuts and shocks equal with a Corn Binder. Sold in every state. Price \$20.00. W. H. BUXTON, of Johnstown, Ohio, writes: "The harvester has proven all you claim for it: the harvester saved me over \$25 in labor last year's corn cutting. I cut over 500 shocks; will make 4 bushels corn to a shock." Testimonials and catalog free showing pictures of harvester.

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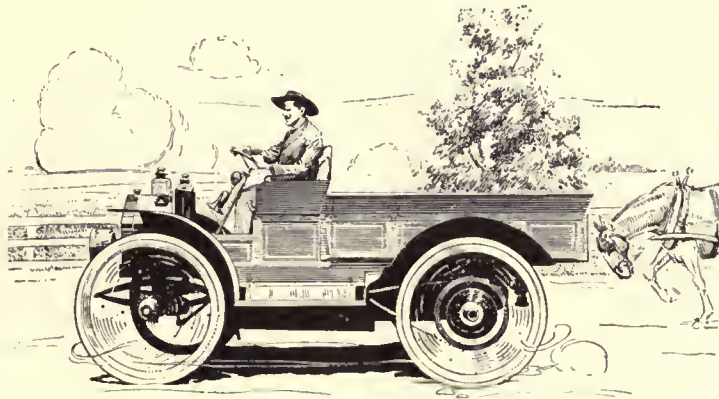
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A PROFITABLE INVESTMENT

Careful tests made by men in all lines of business, including farming, fruit growing, truck raising and kindred industries, prove conclusively that motor delivery and motor hauling are paying propositions. It is only a question of getting the car best adapted to the work you have to do.

In the International Commercial Car we offer the best machine for hauling produce over country roads, for doing light hauling of all kinds, for quick deliveries in cities or towns, for running errands and for pleasure driving. It is designed to meet the needs of men living in the country. The wheels give plenty of road clearance, the engine is powerful enough to carry the car anywhere that horses can go, the solid tires eliminate delays due to pneumatic tire troubles—in every way the car is designed to protect the user against delays.



The many special features of the International Commercial Car are the result of six years' actual experience under all sorts and kinds of conditions. The car has been tested in cities, in small towns, and in the country, and has been improved and redesigned until it is practically perfect.

The International Commercial Car will now give satisfactory service wherever a car is needed for the hauling of loads up to 1,000 or 1,200 pounds.

The efficiency of the complete car depends largely upon the motor. We know now that the motor in this car is correct in design and will give the purchaser the best possible service. It is a two-cylinder opposed, four-cycle motor—a type that has been used for heavy duty service for years.

It will take the driver less time to master the control of the International Commercial Car than any other car on the market. The control is exceedingly simple. There are no levers to confuse, and a simple locking device makes it impossible for the operator to shift from one speed to another without disengaging the clutch. Also, there is no possibility of engaging two sets of transmission gears at the same time. The ignition apparatus is unusually complete. Most cars have a dual system; the International has a triple system of ignition. The ordinary single system consists of batteries working through a vibrating coil and timer; the dual system consists of batteries and a magneto with its own distributor. In the International system if the magneto gives out the batteries work through their own coil and timer. If the vibrating coil gives out the batteries will work through the magneto distributor, while if the batteries give out the magneto current travels through the vibrating coil and timer. It is necessary for the ignition apparatus to be all out of order before this car is disabled.

The general usefulness and simplicity of the International Commercial Car commend it to every man who has work that the car can do. It more than takes the place of horses at a maintenance cost far less than that of the horses necessary to do the same amount of work. It has many other desirable features which will be fully explained to you on request.

For a catalogue and full information write

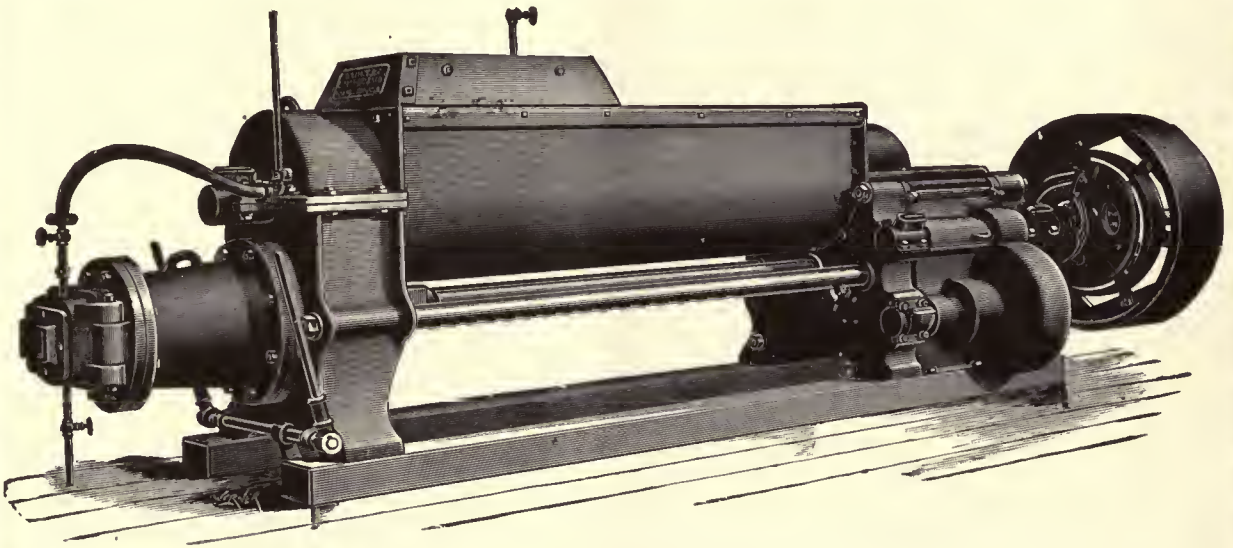
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GALION, OHIO

When writing to advertisers please mention The Irrigation Age.

Hollow Core Wall for Hydraulic Fill Dams

In a Hydraulic Fill dam the problem of the drainage of the sluicing water is of controlling importance. The sluiced material should be such that it will not retain the sluicing water for an undue time. If the material is such that it will not deliver the water with reasonable rapidity a decided settlement with consequent cracks is bound to ensue when the fill ultimately dries out.

The sluicing water on the fill is maintained in a summit pool by hand-made levees. It is found that in depths downwards to 5', the material in suspension becomes comparatively solidified and it will then hold its shape and consistency. The sluicing water, however, must necessarily be under constant drainage if rapid construction and solid banks are expected.

A Hydraulic Fill dam during construction generally has water in the impounding reservoir above it which rises at substantially the same rate as the increasing height of the dam, but a little below its level, thereby reducing the drainage head in that direction. Assuming that there is no core wall, the sluicing water is forced to pass largely through the down stream fill unless drainage tubes in some form are provided. The passage of the drainage water through such a mass of material is slow, and hence full advantage cannot be taken of the otherwise rapid method of hydraulic construction.

Again, the material of the fill will not take its final set until the fill is complete. The fill is therefore saturated during construction, and saturated material is always of greater bulk than dry material. This fact accounts in a measure for the excessive settlement in hydraulic fills.

All this is controlled by building a Hollow Core Wall through the center of the embankment, and providing it with numerous drainage gates of simple construction. A facing of broken stone or gravel should be placed next to the upstream face of the core wall.

It is evident at a glance that with this construction we have accomplished two things:

First, we have provided an effectual water-barrier whereby when the lower prism of the dam is once drained it is forever protected against re-saturation.

Second, the problem of drainage is entirely under control and can be hastened or retarded at will. Drainage head is secured in two directions, namely, towards the core and towards the toe. The material more quickly receives its final set and unexpected settlement is thereby avoided. The time of construction is greatly hastened.

Moreover, in the usual form of construction the levees on the outside edge of the pond frequently give way and permit a localized washout on the slope of the fill. The central drainage into the Hollow Core Wall permits of instant relief of excessive water and makes a washout impossible.

Again, if the sluicing material is such that it settles rapidly, the surface water can be quickly drawn off into the Core Wall.

Once the fill is completed the drainage gates into the Core Wall from the lower prism are permanently opened. This insures an absolutely dry prism; a result never before reached.

The above is a mere outline of the functions of the Hollow Core Wall in relation particularly to the Hydraulic Fill during construction. The advantages named in a previous advertisement in connection with an ordinary rolled earth dam apply in full to the Hydraulic Fill when the same is completed and in permanent service.

The above notes are fairly illustrated by the sectional drawing herewith presented which roughly represents a Hydraulic Fill Dam in process of construction. The Hollow Core Wall is carried up to and a little above the ultimate embankment and provides interior inspection through the heart of the fill.

This topic is more fully treated in our Circular on EARTH DAMS. The introduction of the Hollow Core Wall entirely changes the basic problem of an earth dam, whether of rolled earth or hydraulicked into place. These points will not admit of discussion in an advertisement.

Respectfully submitted,

AMBURSEN HYDRAULIC CONSTRUCTION CO.
ENGINEER-CONSTRUCTORS, 88 Pearl St., Boston, Mass.

All inquiries from Canada should be addressed to
Ambursen Hydraulic Construction Co.,
405 Dorchester St., West, Montreal, P. Q.



HYDRAULIC FILL DAM WITH HOLLOW CORE WALL IN PROCESS OF CONSTRUCTION

SPECIAL NOTICE

We take pleasure in announcing that we have perfected an arrangement whereby Messrs. Lewis & Wiley of Seattle, Washington, become associated with us in all work involving the sluicing of earth for the construction of dams or for any other purpose. The reputation of the above concern was made in the famous re-grade of Seattle, whereby the hills of that city were cut down and used for fill on the water front. A similar contract has been carried out by this company in Portland, Oregon, and a third one is now in progress in Seattle.

Messrs. Lewis & Wiley are undoubtedly the foremost concern in the world in this special line of work, and we deem ourselves fortunate in securing their association with us.

**AMBURSEN HYDRAULIC
CONSTRUCTION CO.**

Unless the
Sides of a
Drainage Ditch
are Sloped
They will
Wash and Cave
into the
Channel



Austin Drainage Excavator

Nature Will
Slope the
Sides of a
Drainage Ditch
But She Will
Spoil the
Ditch
in Doing It

Thirty-Two Thousand Cubic Yards of Excavation in One Month

Ranks in output with the world's largest outputs of machine excavators—for example, with the steam shovel records at Panama.

¶ We specialize in ditching machinery both for open ditches and pipe line work. These various machines are known to contractors as the "AUSTIN LINE," comprising the following:

Drainage Excavator—Type A
Drainage Excavator—Type B
Drainage Excavator—Type R
Levee Builder
Drag Line Excavator
Special Wheel Ditcher
Side Hill Ditcher
Highway Ditcher
Orange Peel Ditcher
Pipe Line Excavator
Farm Tile Ditcher
Austin Sewer and Waterworks
Excavator
Austin Combination Sloping or
Vertical Bank Excavator

This is exactly the record of an Austin Drainage Excavator constructing a drainage ditch in a middle western state—we can show the contractor's signed statement.

As an earth moving machine alone an Austin Drainage Excavator is in the same class as the dredge or the steam shovel.

As a ditch building machine it is in a class entirely by itself, since it digs a ditch to templet with sloping banks complete in one operation.

It being impracticable to dredge the banks to slope, extra material is removed from the sides so that when the banks cave to slope the ditch will not be choked, and this extra digging, while adding to the yardage removed, does not add to the mileage of ditch completed. On the other hand with an Austin Drainage Excavator, which slopes the banks by the same motion that removes the earth, and also cuts to templet to exact dimensions, every yard excavated counts towards mileage of ditch dug.

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CHICAGO

5 Great Valleys

Along the Santa Fe are five Great Valleys. Every one of them will soon be supporting an immense population. Land can be bought today at reasonable rates and on liberal terms. In five years it will double or triple in value. Two million and a half acres are now, or soon will be, irrigated. Irrigation insures crops. No drouth; no wash-out; no uncertainty. Turn on the water; when you have enough to fulfill your requirements, turn it off. The seasons are long, the variety of crops almost limitless. Read this page carefully.

San Joaquin Valley

The San Joaquin Valley of California embraces the eight counties between Bakersfield and Stockton.

It is a country for a man of limited means. Ten acres will support the average family, while twenty acres means a bank account in three or four years.

Fruit, vines, vegetables, cereals, all do well. While waiting for his orchards and vineyards to begin bearing, the settler can earn a good living with alfalfa, dairying and poultry.

Crops follow one another throughout the year so that the farmer who will attend to his business can always have something on hand to sell.

Large returns are received from peaches, apricots, wine, raisins and table grapes, figs, small fruits of all kinds, sweet potatoes, and alfalfa, while oranges are yielding big returns along the foot-hills.

Land is still to be had at reasonable prices. Terms are liberal and easily met. The expenses for improvements are slight.

Arkansas Valley

There are 500,000 acres of land under irrigation in the Arkansas Valley of Kansas and Colorado. The 3,000 miles of canals and laterals cost \$10,000,000.00. More sugar-beets are grown in this valley than in any other part of the United States. Six large beet-sugar factories are now in operation.

Beets grown in this section have a high percentage of sugar, and the crop is a very profitable one. Another staple is alfalfa, which yields a heavy tonnage and allows three or more cuttings a year. There is a strong demand for every ton grown, and prices are good.

The famous Rocky Ford cantaloupe is grown in this valley and is a big money maker. Fruits of all kinds do well. The climate is all but ideal; the altitude about 3,600 feet; the air invigorating; and the sun shining almost every day, makes the valley a delightful place to live in.

Lands are still to be had at very reasonable prices.

Rio Grande Valley

In the Rio Grande Valley of New Mexico, the Reclamation Service has projected a system of irrigation that will cost \$10,000,000 and will reclaim 200,000 acres of land. It is proposed to dam the river near Engle, New Mexico, one hundred and twenty miles above El Paso.

It will be three years or so before the Engle Dam is completed. In the meantime a diversion dam has been put in to irrigate about 85,000 acres in the Mesilla Valley.

Now is a good time to get in "on the ground floor," as the irrigated land in this fertile valley, with an assured water supply, will command big prices.

With a beautiful climate and rich soil, a great variety of crops are grown.

The population in this valley is made up of a good class of eastern people, the towns are progressive and up-to-date.

Pecos Valley

In the Pecos Valley of New Mexico irrigation has worked wonders. The Government irrigation project and private gravity canals, now completed, together with more than 400 artesian wells, every one of which will irrigate 160 acres of land and a large number of pumping plants, will insure the development of upwards of 100,000 acres of the rich land.

Crop yields are very large, and the climatic conditions are all that could be desired. Apples and peaches grow to perfection, the fruit being of unusual size, without blemish of any kind, and of a distinct flavor.

Ten acres in apples insures a good income, while twenty acres means independence.

Alfalfa will yield six tons to the acre and finds a ready market at \$10 a ton. By feeding stock, the value of this crop is easily raised 50 per cent.

The Valley enjoys the best of schools and churches, and in the principal towns, public library, water works, electric lights, etc.

The Salt River Valley

The Roosevelt Dam, in the Salt River Valley, Arizona, is complete, and the impounded waters are being carried to the 240,000 fertile acres, included in the project, through a complicated network of perfectly constructed canals and laterals. In coming from the dam to the floor of the Valley, the waters are passed through a number of turbines, which generate several thousand electrical horsepower that is used for light and power all over the Valley. Eventually this electrical power will more than pay the upkeep of the system and the farmer's water will cost him practically nothing. The climate of the Salt River Valley is well suited to all crops commonly grown in the temperate and semi-tropic zones.

The great development of Arizona's mineral wealth insures a profitable market for all produce grown. If you are looking for a sure thing you cannot do better than to investigate this Valley.

We have published booklets descriptive of each of the Valleys mentioned above. Which interests you most? Let me know and I will send you copies.

We have a man in this office who is hired to answer questions and tell the truth. Use him.

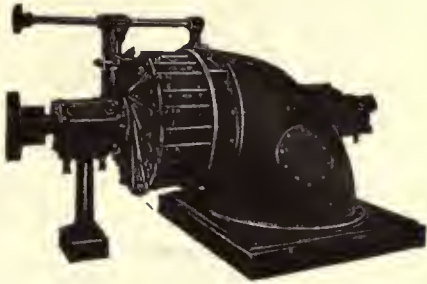
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General Colonization Agent
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CHICAGO, ILL.

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316 Lagonda Street

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"BALL BAND"

RUBBER FOOTWEAR

If it doesn't keep the water out for a long time even under hard wear, it is a poor boot. Now, we want you to prove for yourself that boots marked with the Red Ball, the trade-mark of "Ball-Band" Quality, are a satisfactory result of the honest determination to build perfect boots. Ask your dealer what is the best rubber boot he sells. If the dealer doesn't say "Ball-Band," the chances are he doesn't sell "Ball-Band" Rubber Footwear. Over eight million men who wear our boots believe them to be the best boots they can get for their money. If your dealer doesn't sell "Ball-Band" Boots or hasn't your size, write us.

Look for the "Ball-Band" mark in the store windows and on the boots. If the Red Ball is not there you are not buying the boots we make.

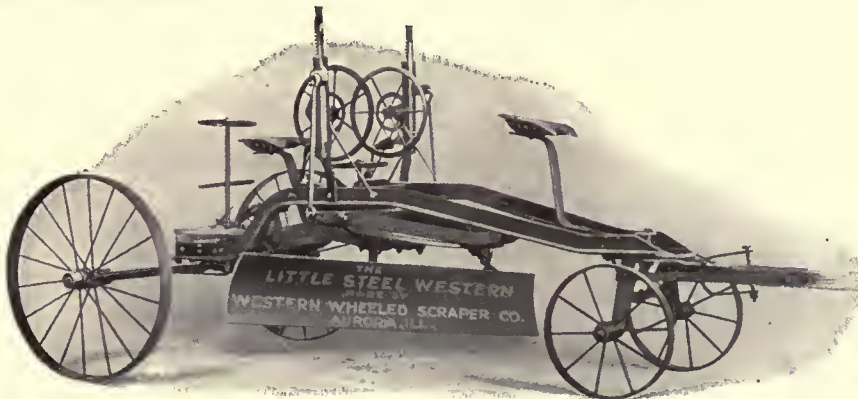


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Mishawaka, Ind.
"The House that Pays Millions for Quality"



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which practical irrigation men **MUST** notice on the **LITTLE WESTERN GRADER AND DITCHER**



1. High arched frame which gives strength and provides **AMPLE CLEARANCE** for all angles of blade adjustment.
2. The "FLOATING" type of blade mounted on a ring and so thoroughly **BALANCED** that it is easily and quickly manipulated with one hand.
3. It has the pivotal rear axle which sets to prevent skidding on heavy side draft.
4. It has the **EXTENSION REAR AXLE** which enables it to do the varied work done by our larger graders. No small ditcher is competent to do good work without such an axle.
5. It has **FOUR** wheels which are **ESSENTIAL** for even work and light draft.

Write for our printed matter on every class of earth handling and ditching machinery

THE AUSTIN-WESTERN CO., Ltd., Chicago

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MAKE MONEY MAKING CEMENT TILE

The field is unlimited and uncrowded; marketing the product in competition with the clay interests and at clay tile prices produces a great profit and a glance at the future spells only success for the factory or business started today.

No existing proposition offers such flattering inducements or such a field of opportunity for the man looking for a vocation or for the man looking for an investment. No other business can net you such profits on the amount of capital involved, and no other business has such an unlimited future.

Just think of a business paying from 30% to 50% on the investment the very first season, and subsequently from 50% to 150%, then ask yourself the question—Is it worthy of investigation?

Our literature gives you all the details regarding the merits of cement tile, the cost of manufacture, the amount of capital required to embark in the business; how to build your factory and last, but not least, it tells you how we aid the manufacturer using our machinery and gives you our full and complete proposition. A short letter telling that you are interested will bring complete data.

The Cement Tile Machinery Co.

172 Rath St., Waterloo, Iowa.

The Rural Road Grader For Irrigation Work

The blade of the Rural has the proper adjustment for making V Bottom Irrigation Ditches on a slope of one and one-half to one. Any elevation can be given the blade that the banks will stand. Rear end of blade raises 24 inches. Changing single-tree holes in the eveners, which places the rear horse in the ditch, is the only change needed in the Rural to adapt it to V bottom ditch work. The wheels being wide apart, which best holds a grader to its work, and lets one wheel travel in the point of the ditch and the other completely outside of the bank of earth thrown up, leaving the slope smooth and undisturbed.



Making a V Bottom Irrigation Ditch Two Feet Deep on a Slope of One and One-Half to One. Two or Four Horses are Used, According to Requirements.

The Rural Grader is not tipped to any extent, owing to the wheels being wide apart and the axle having been made lower on the right hand side to equalize up on ditch work. In a grader with the wheels close together, one, and perhaps both, of the wheels must travel on the slope of the ditch, destroying the bank and tipping both machine and operator to a dangerous angle. Unequaled for cleaning out all deposits of silt, grass, etc., from irrigation ditches, whether dry or under water, anywhere teams can be made to travel. For the Irrigation Farmer, the Rural Grader and Ditcher is not equalled by any other machine if he wants one for business and the greatest value for his money. Any One with considerable level land can use one with much profit for opening up ditches through fields, which it will do, even when the lands are under water. To make larger and more permanent ditches and also to build and repair roads that the farmer is interested in.

C. D. EDWARDS, Albert Lea, Minn.

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AMERICAN SEEDING MACHINE CO., (Inc.)
Springfield, Ohio

GRAIN DRILLS

Merchants and Manufacturers

who contemplate establishing plants in the West and Northwest should take advantage of a location on the

Chicago and North Western Ry.

which reaches the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and Soft Timber Districts of the West and Northwest, and affords the best means of transportation to the markets of the world.



For further particulars apply to

George Bonnell,
The Pioneer Line West and Northwest of Chicago Industrial Agt., Chicago, Ill.
N W 2653

Twenty-Eighth Year

THE IRRIGATION AGE

VOL. XXVIII

CHICAGO, FEBRUARY, 1913.

No. 4

THE IRRIGATION AGE

With which is Merged

The National Land and Irrigation Journal

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST

THE FARM HERALD
THE IRRIGATOR

D. H. ANDERSON

PUBLISHER,

30 No. Dearborn Street,
Old No. 112 Dearborn St.

CHICAGO

Entered as second-class matter October 3, 1897, at the
Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

The "Primer of Hydraulics" is now ready; Price \$2.50.
If ordered in connection with subscription \$2.00.

SUBSCRIPTION PRICE

To United States Subscribers, Postage Paid, . . . \$1.00
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In forwarding remittances please do not send checks on
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Official organ Federation of Tree Growing Clubs of
America. D. H. Anderson, Secretary.

Official organ of the American Irrigation Federation.
Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 28 years old and is the pioneer publication of its class in the world.

ANNOUNCEMENT

As intimated in our editorial columns in December and January, the publisher of the IRRIGATION AGE has purchased all the rights, copyright to the title, good will and advertising contracts of the National Land and Irrigation Journal, published by the National Irrigation Journal Publishing Company of Chicago.

The IRRIGATION AGE has also taken over the entire subscription list of this journal and this new list which is in our hands at present comprises something over five thousand names.

The subscription list of the National Land and Irrigation Journal will be merged with that of the IRRIGATION AGE, and the subscribers to the Journal will receive copies of the IRRIGATION AGE in lieu of the National Land and Irrigation Journal during the period for which their subscription has been paid.

In taking over this property the publisher of the IRRIGATION AGE has also taken over the list of The Irrigator, a journal formerly published at North Yakima, Washington, which was purchased by the National Irrigation Journal Publishing Company and merged with that publication a year or more ago. This merger, and the subsequent taking over of the property from the National Land and Irrigation Journal, places the IRRIGATION AGE in the unique position of being the only distinct irrigation and reclamation journal in the known world.

As may be easily understood, this has greatly strengthened our subscription list and we are in a position today to offer advertisers much better service than at any time in the history of this publication.

The editorial policy of the IRRIGATION AGE will not be affected in any way by this change, as the undersigned is in full control and is sole owner of the AGE and its various interests.

It may not be out of place to state here that the combination of the National Land and Irrigation Journal of Chicago and the Irrigator of North Yakima with the IRRIGATION AGE completes a list of eight publications which have been purchased and taken over, and whose circulation has been merged with that of the IRRIGATION AGE.

The list comprises the following papers, all of which were well known in their day

The National Land and Irrigation Journal,

The Irrigator,

Modern Irrigation,

The Irrigation Era,

Arid America,

The Drainage Journal,

Mid-West,

The Farm Herald.

D. H. ANDERSON, Publisher.

Explains Deals With Reclamation Service

We notice that Mr. Dwight B. Heard of Phoenix, Arizona, is making a strong effort through his publication, the *Republican*, of that city, to explain his transactions with the Reclamation Service.

There will, no doubt, be more heard about this subject after a full report of the matter comes from the hands of the sub-committee and of the Attorney General at Washington.

Good Field for Advertisers

By the merger of the National Land and Irrigation Journal of Chicago and the Irrigator of North Yakima, Washington, with the IRRIGATION AGE, we are able to offer our advertisers fine inducements in the way of increased circulation. It will be well for advertisers generally to consider this great and growing field where a market may be developed for all classes of machinery used on farms and ranches, or in connection with work or large irrigation projects.

Borah's Letter to President Wilson

The IRRIGATION AGE intends to take up and discuss fully, in a future issue, Senator Borah's letter to President-elect Wilson, which was forwarded to the President-elect on February 13.

Senator Borah is familiar with conditions in the West and is, no doubt, fully capable of offering suggestions which, if adopted, will be beneficial to the western country. Senator Borah points out in his letter the plain duty of the government in the matter of reclamation.

Active in Defense of Their Position

It will be noted that Gifford Pinchot and many others who have been identified with him in his so-called work of conservation are becoming active in the defense of their position.

A letter addressed by Pinchot to the *Examiner* of Chicago is an attempt to justify his position while filling the office of chief of the Forestry Division.

In the opinion of the IRRIGATION AGE, a true history of his efforts along this line should be given out, but no doubt his connection with the Forestry and Reclamation bureaus will receive attention by either the present sub-committee or the committee which Senator Borah will attempt to have appointed through a bill now before Congress for that purpose.

The next two or three years will, no doubt,

bring out many interesting features concerning the work of conservation and forestry and the connection of these bureaus with the Reclamation Service, which have never hertofore seen the light.

Reclamation Service Work in Arizona

The report of the special committee which has been investigating the reclamation service work in Arizona, extended mention of which is made elsewhere in this issue, will prove very interesting reading.

The report, summarized, has appeared in the leading daily papers throughout the country and has created something of a furore, owing to the direct statements contained therein.

It is now up to the Reclamation Service to disprove many of the charges made in this report, or prepare to make way for a new administration of affairs in that bureau.

Irrigation Age Advertising Department

The IRRIGATION AGE wishes to announce that, beginning with the issue of March, 1913, the advertising department of the paper will be in the hands of the E. C. Sortman Company, who have branches in St. Louis, Kansas City, New York and Chicago, and a general and thorough campaign will be inaugurated to develop trade for this journal through that source.

The E. C. Sortman Company will act as agents for this journal and will relieve the publication office of the detail of following up, by personal visits and correspondence, the advertisers and manufacturers generally and making them familiar with the merits of this publication.

Under our old system the entire business was conducted from the publication offices at 30-32 North Dearborn street. All advertising will now be handled by E. C. Sortman Company and correspondence concerning that subject can be addressed either to the publication office, 30 North Dearborn street, or E. C. Sortman Company, Harris Trust building, Chicago.

Montana Citizens Ready to Fight

Members of the House of Representatives of Montana recently "took a fall" out of the United States Reclamation Service and incidentally made some sensational charges against the administration of Montana projects during a recent debate on the House resolution introduced by Representative Jewell providing for a probe of the Carey Act land and reclamation projects.

Various representatives scored the extravagance

of the service in handling Montana projects and added to their storm of protest came an attack by James Harbert, chairman of the Polson Chamber of Commerce, who was accorded the privileges of the floor. Representative Rhodes stated that some objection had been raised to the adoption of the resolution, for the reason, it was claimed, that it would require the expenditure of a large sum of money. He stated that he had no complaint to make against the Carey Act Land Board of the state, and that he knew nothing whatever of their operations, but that the people of Northern Montana were heavily interested in several government projects, including those on the Flathead, the St. Mary's, the Sun river and Milk river work.

The question arose as to whether the Legislature of the State of Montana has a right to look into a government project. Mr. Rhodes stated that the people of the State of Montana have that right if they desire to utilize it. He states that the people have suffered in many ways and that they have had their lands deeded away; that they have given quit-claim deeds to water users' associations at the solicitation of the head of the Reclamation Service; that they have deeded away their water rights to the government on the representation that they were to receive water from these canals, and that year after year they have witnessed their crops burned up by the sun, while at the same time the water was flowing through these streams, and they were not permitted to divert it onto the land on which the crops were planted.

Citizens of Montana are evidently similarly situated to those in many other sections where the brass band method of securing signatures and quit-claims by property owners to the water users' associations has begun to take effect.

There will, no doubt, be much more heard from other sections now that the thing has been started in Arizona, Montana and one or two other states.

Advertising Rates Advance March 1, 1913

The IRRIGATION AGE is pleased to announce, as may be seen elsewhere, the taking over of the National Land and Irrigation Journal and the Irrigator, which leaves it entirely alone in the field of irrigation publications throughout the world. The IRRIGATION AGE, the pioneer publication of its class in the world, has had its ups and downs like all other journals which have been representing an interest with which the general public is not entirely familiar. There have been many attempts made on the part of other newspaper men to establish journals along this line in various parts of the

country, some of which have been successful, and many others have failed from lack of support.

The fact of the matter is, that at the present stage of development one publication can very comfortably cover the entire field, while the support for two or more is necessarily limited. Owing to the fact that the IRRIGATION AGE has been in existence for twenty-nine years and was the pioneer journal of its class in the world, this publication has been able to hold its own against all competition and, as stated elsewhere, has purchased various other journals to the number of eight during the past ten years, all of which, including the subscription list of each, has been merged with that of the IRRIGATION AGE.

It may be easily understood that a merger of this character places at the disposal of advertisers, generally, a fine field for opening up trade throughout not only the irrigated areas of our Western country, but the irrigated districts of foreign countries, where immense tracts are being cultivated under irrigation. This is particularly true of Australia, Africa, India, Ceylon and several states in South America. In all of these countries the IRRIGATION AGE has a live and growing circulation.

It may, therefore, be seen that manufacturers of heavy machinery for developing great projects may bring their various products to the attention of prospective purchasers, both at home and in foreign countries, through the columns of the IRRIGATION AGE.

Owing to the increased expense in taking over these other journals and filling their contracts on subscriptions, it will be necessary to increase our advertising rates 25 per cent, and the new rate will go into effect March 1, 1913.

Secretary Fisher Defends Service

Secretary of the Interior Fisher has recently issued a statement in defense of the Reclamation Service, against whom charges of incompetence and maladministration have been made by the House Subcommittee on Interior Department expenditures.

Secretary Fisher states that he would have no comment to make about this sub-committee report were it not that he thinks the higher-minded officials whom it criticises are entitled to have him say that this report relates to transactions most of which happened years ago, and the engineering works which were gone over by the Board of Army Engineers which investigated all of the reclamation projects in 1910.

Secretary Fisher exhibits a woeful lack of knowledge of the general conditions concerning irrigation in making this statement. It is a well

known fact that the transactions in connection with the Salt river and Gila river irrigation projects in Arizona did not happen years ago, and could not, in any event, have happened over ten years ago, and during all of that time the present director and a goodly number of his assistants have been active in the work. Furthermore, if Secretary Fisher will read the report of the Board of Army Engineers that investigated these reclamation projects he will learn that their criticism of the works was in line with the criticism recently made by the sub-committee.

It is presumed that the secretary has been so exceedingly busy that he has not had time to go carefully over this report, and it is feared that some of his subordinates may be working hand in glove with Reclamation Service officials, and that he, in that way, has not been permitted to get all of the facts, although it was clearly his duty to make a careful study of the report of the army engineers.

It may not be out of place to state further in this connection that this report of the Board of Army Engineers has never had a very wide circulation. The only copy the IRRIGATION AGE has been able to secure was borrowed from a Reclamation Service official who insisted upon its return within a given time, and this in itself would indicate that they were not particularly desirous of having the information contained in that report spread broadcast.

It is a strange fact that the report of the Board of Army Engineers was not given more attention by the daily press of the country. This may possibly have been due to the peculiar wording of the report, which was framed in the style of all reports emanating from army headquarters or army officials.

Naturally, this board was inclined to skim over some of the more flagrant features of the irrigation work throughout the country. They, moreover, were not the likeliest class of men to appoint on a committee of this kind, as their studies have naturally been along other lines which would not familiarize them with the details of irrigation development.

A committee composed of leading engineers picked from various sections of the country who have no bias in the matter and who have no intent other than to give actual facts as they exist would have presented a report with more clear conclusions.

Secretary Fisher states that his first assistant, Secretary Adams, is held responsible for three rulings, two of which were made during the administration of Secretary Garfield. This, to say the least, is not a very high compliment to his predecessor in office.

Galloway Statements Are Questioned

In a recent dispatch from Washington we note that Dr. B. T. Galloway, chief of the Bureau of Plant Industry, states that the Department of Agriculture is working hard to overcome the recognized dangers confronting farming on irrigated lands. Dr. Galloway's testimony was given before the House committee on expenditures in the agricultural department, and he informed this committee that the department hoped to put irrigation farming on a firm basis for the future, and that the danger lies not only in the alkali in the soils of irrigated lands, which wash down into other lands, but also in what the expert terms the "wearing out" by saturation.

In Dr. Galloway's testimony he states that he will go so far as to say that, so far as he knows, there has never been any long continued irrigation in semi-arid climates anywhere in the world.

This is rather a peculiar statement to come from a man who holds so important a position as Dr. Galloway. It is a well known fact that irrigation has been practiced in various countries of the world and on some of the land for centuries. This is true in China, Egypt, Peru and some of the sections of our southwestern states where agriculture, under irrigation, is being carried on successfully today on land that, the best knowledge we may obtain informs us, was being irrigated at the time of the Spanish invasion, and a study of the first bottom lands of the Rio Grande valley below El Paso will show the markings of prehistoric ditches, and these lands also show fertility beyond that of any soil known in the United States. Hence they could not have been over-irrigated, nor could the humus have been washed out of the soil in the elimination of alkali. On the other hand, crops could not have been successfully grown had alkali proved a serious menace. These relics of early irrigation indicate that there were engineers of wonderful ability in those days and they, no doubt, had some plan to cope with the conditions that confront our present bureau heads in the Department of Agriculture.

It is reasonable to suppose that where land is heavily charged with alkali, and where the land has been over-irrigated, and the ground water table raised to the surface, bringing with it deleterious salts, a system of leaching by drainage should, no doubt, be carried on. Where these conditions exist to an unusual degree the leaching process carries away with it the humus and life-giving salts of the soil along with the alkali.

It would seem that a reasonable study, such

as was given the subject by Dr. Elliott, formerly of the Bureau of Drainage Investigations, would permit of some plan being carried out which would eliminate the alkali or reduce its quantity without taking away the humus or salts essential to plant life.

The statement of Dr. Galloway is rather terrifying and would be inclined to hold up, rather than encourage, appropriations for extensive work in connection with his bureau.

Mr. E. C. Parker, a St. Paul land expert, agrees with Dr. Galloway that irrigated soils in the West are being threatened. Mr. Parker was formerly connected with the state agricultural college and was at one time in the service of the Chinese government as soil expert.

Land men generally are not inclined to believe that conditions are as serious as Dr. Galloway and Mr. Parker state, although they generally disclaim exact scientific information on the subject.

Mr. Parker states that, as he understands Dr. Galloway's statement, the water will carry away the food elements of the soil, as improper irrigation takes the plant foods and this solution is carried away at the time of the leaching process, which is the method of eliminating the alkali.

The whole matter evidently simmers down to a careful study of the quantity and application of water upon all soils where irrigation is necessary and a very careful examination of the possibility for natural drainage.

Frequently one will find a field waterlogged and made useless by over-irrigation, while an adjoining field with the same quantity of water does well and produces good crops. This is due, no doubt, to the formation which, in one instance, allows the ground water as a result of lack of drainage, to accumulate from one irrigation and another, and eventually come to the surface and destroy all plant life.

The only solution in a case of this kind, so far as we know, is proper drainage, and this should be studied very carefully to learn if some system may not be devised whereby the alkali may be eliminated by the means of gross feeding plants to bring the soil back to a comparatively dry condition and, by draining the remaining water table, clear the soil without taking away the plant food for a reasonable distance below the surface.

The writer is not sufficiently familiar with the subject to offer suggestions, excepting in a general way, and would not attempt, in any event, to belittle or criticise the judgment of either Dr. Galloway or Mr. Parker, or others who have made a life study of this subject.

It would not be a bad idea, however, for the Department of Agriculture to secure the co-opera-

tion of a man as well posted as C. G. Elliott, former chief of drainage investigations. Dr. Elliott has made a careful study of these conditions throughout certain over-irrigated areas in California and would, no doubt, save the government a great deal of money through his assistance and advice.

Sub-Committee Report on Arizona Affairs

The House of Representatives' Committee on Expenditures in the Interior Department, of which Representative James M. Graham of Illinois is chairman, in a recent report has dispelled the mirage that for years

hovered over the Roosevelt dam in Arizona and has laid a foundation for a sweeping investigation of the Reclamation Service and all of its affairs. A sub-committee consisting of Representatives W. L. Hensley (chairman) of Missouri, Oscar Galloway of Texas and Louis B. Hanna of North Dakota visited Phoenix and, unlike previous investigators, proceeded to learn actual conditions from the farmers. The committee was assisted by M. C. Burch, attorney of the Department of Justice, and Edward C. O'Brien, special assistant to the Attorney General. The usual blandishments of the reclamation officials and the captivating entertainment of the large land speculators seems to have been wasted on the desert air, judging from the printed report.

The report sketches in outline the history of irrigation along the Salt and Gila rivers since its beginning with the Indians. On both sides of the Gila lies a reservation of the Pimas and Maricopas, who have irrigated for hundreds of years. White settlers above them appropriated their water until they had little or none left. One of the arguments used to secure the passage of the Reclamation Act was the opportunity to build a dam on the Gila which would save these wards of the government from starvation and also provide water for 100,000 acres of the public domain where actual settlers could make homes. As soon as the act was passed, George H. Maxwell, the report states, was able to sidetrack the Gila plan and substitute a scheme to supply the large land speculators along the Salt river with water by means of the Roosevelt dam. When the Southern Pacific made known its desire to secure the dam site on the Gila for a railway right-of-way, the engineers of the Reclamation Service met and decided the site not feasible for a dam, although the same engineers, when urging the passage of the Reclamation Act, stated in effect that the site was suitable for a structure that could be made "as enduring as time."

According to the report, the estimated cost of the Salt river project was \$3,800,000, and the actual

cost has run far in excess of \$10,000,000. As the Reclamation Act limits the amount the government can recover from the settlers to the estimated cost of construction, the committee draws the conclusion that the government's loss on this project to date is nearly \$7,000,000. In accounting for this startling difference, the committee cites innumerable instances of waste, extravagance and incompetence. "No care seems to have been taken toward economy and dispatch like that general in private enterprises," says the report. "Expensive concrete works were installed by one engineer, condemned by a second and blown out with dynamite; the like repeated a second time. Some of these works cost \$2,000 for each installation. The time of large crews of men was wasted by camping them miles from work and making four trips a day to and from camp to the scene of operations. Owing to ignorance or carelessness in mixing concrete, large sections washed out when water was turned into the canals."

The business transactions of the service are severely scored. Canals were purchased from corporations at prices aggregating over \$700,000, while the actual farmers received \$1 for a canal built by them at great expense. The Indians on the Gila were in effect cut down to receive water for 10,000 acres and this area mortgaged to such an extent by the expense of operating pumps that, in the opinion of the committee, it is only a question of time until the remaining 10,000 acres are taken from them. Reclamation Service work on the Gila cost more than \$500,000 and the committee states that it was "disastrous to the Indians and valuable only to land grabbers."

A. J. Chandler, who, the report states, defrauded the government out of 18,000 acres of land by the "dummy entry system," received \$187,000 for a worthless canal and the Reclamation Service, through that same canal, furnishes water to the very lands of which the government was defrauded.

A contract by which the Pacific Gas & Electric Company, a private Los Angeles corporation, is given a monopoly of the electric power generated at the Roosevelt dam, in violation of law, is discussed and the committee recommends that the Department of Justice be instructed to institute a suit in equity to cancel the contract and commence such criminal proceedings as the facts warrant. "The business transactions of the Reclamation Service generally in Arizona have been conducted in the twilight zone," says the report. "If actual fraud does not exist, it can at least be said that many of the badges of fraud are evident in these transactions."

The report dwells at length on the discrimina-

tion by the Reclamation Service against the farmers and in favor of the large land speculators. "Prior to the coming of the Reclamation Service to Arizona, the actual farmer had water for his land," says the report. "The land grafter did not have. And only by the storage of a large body of water would it be made possible for these speculative lands to be parceled out in small tracts at enormous profits. The speculators enjoy 90 per cent of the benefit and the pioneers assume 80 per cent of the burden. The new farmers upon whom the speculators unload pay the remaining 20 per cent of the cost. The speculators are required to pay nothing. The press bureau for glorifying these officials and advertising the lands for the speculators is to be saddled upon the farmers."

A number of photographs "not taken by the official stenographer" are submitted with the report, showing the bad condition of the work of the service on the Gila river.

The committee states that the revelations made of the conduct of the reclamation work in Arizona prompted it to inquire further. The estimated cost of construction of the twenty-five "primary projects," as reported by the Secretary of the Interior to Congress, is \$49,760,000. In 1910 the Reclamation Service "estimated" it would cost \$150,549,755 to do this same work. As the government's recovery from the settlers is limited to the estimated cost, the committee concludes that the government's loss will be in excess of \$100,000,000. "The 1910 guess at the cost is more than 300 per cent of the original estimate," says the committee. "Such dalliance with millions of dollars and other serious matters by persons styled 'engineers,' but whose mathematical work would discredit a village high school, is calculated to breed contempt for the government in the public minds."

Of the completed projects, Garden City, Kansas, Carlsbad and Hondo, in New Mexico, are described as total failures, and Okanogan, in Washington, will cause a minimum loss of \$4 per acre to the government.

In conclusion, the committee asks for the appropriation of \$25,000 to make a complete investigation of reclamation affairs; asks that the President remove from office during such investigation Samuel Adams, Assistant Secretary of the Interior; F. H. Newell, Director of the Reclamation Service, and L. C. Hill, supervising engineer at Phoenix. This action is asked to "prevent possible obstruction of progress by these officials." The committee also recommends that civil and criminal actions be instituted with reference to the dealings between the Reclamation Service and the Pacific Gas & Electric Company; that speculative lands pay the full value

of the benefits received and lands under cultivation prior to the coming of the service be assessed a comparatively small amount; that no tract of land in private ownership be supplied with water unless sold at prices approximating those at which the government lands are sold to settlers; and that pending the building of a dam on the Gila the Indians there be supplied with water from the Roosevelt dam.

While this report comes as a shock to persons not familiar with reclamation affairs, it occasions no surprise to those who for years have labored in every way possible to prevail upon the officials of this service to do their plain duty. Many of the matters complained of have been repeatedly criticised through the columns of this magazine. The storm that has been gathering for over ten years has broken, and when the sun again shines through the clouds we hope it will illumine the homes of happy, prosperous farmers instead of the dismal habitations of despairing beings "scourged to their dungeons like the quarry slaves at night."

We are informed that the Stockton River Regulation Association which has been supporting the bill of Senator Newlands, providing for river regulation and flood control announced recently that a fund of \$12,000 would be raised in Stockton, and \$30,000 additional in northern California for the campaign in aid of the Newlands measure which provides for an appropriation of \$50,000,000, divided into ten equal installments, for the improvement and control of the Sacramento and San Joaquin rivers. Half of the \$12,000 necessary has been pledged, and it is now suggested that the western people co-operate with Pittsburgh, New Orleans, and Los Angeles, where similar organizations have been organized.

As stated in a former issue, it would be well to investigate carefully and learn what use is made of this money and how much of it goes into the hands of George H. Maxwell and his co-workers. Judging from past experiences, caution is advised.

The question which presents itself to us is, why the people of the Sacramento valley, or elsewhere, find it necessary to provide a fund to carry the passage of a bill which, if as good as represented, should pass on its merits. We cannot understand where all this money will go if Pittsburgh, Los Angeles, New Orleans, Mobile, Stockton and northern California towns are called upon to contribute.

If Mr. Maxwell and his friends will come out and explain what the money is to be used for, and why it is necessary, it would appear that they will find it less difficult to secure what is needed.

SUBDIVISION OF ESTABLISHED FARM UNITS.

An increasing desire on the part of the settlers on irrigation projects to take up small farms has necessitated regulations facilitating the subdivision of established farm units. On most of the government projects the farm units consist of forty and eighty-acre tracts, the majority containing eighty acres. So many applications have been received for the smaller tracts that the Secretary of the Interior has issued the following order:

ORDER.

AMENDMENT OF REGULATIONS RELATIVE TO SUBDIVISION OF FARM UNITS.

1. Entry may be made of a part of an established farm unit (a) when the remaining portion of said unit is also desired for entry simultaneously by another person, and is, in the judgment of the project manager, sufficient, if carefully managed, to return to the reclamation fund the charges apportioned to the irrigable area thereof; or (b) can be advantageously included as part of an established farm unit; or (c) can, in combination with existing farm units, be advantageously replatted into new farm units, each sufficient, if carefully managed, to support a family and return to the reclamation fund the charges apportioned to the irrigable area of the several new farm units.

2. Where it is desired to make entry of part only of a farm unit, an application for the amendment and subdivision of each unit should be filed with the project manager. If such subdivision is rectangular and survey is not required to determine the division of the irrigable area of the farm unit as proposed to be divided, no charges will be made. If a survey shall be found necessary to determine the boundaries of the subdivision of any such farm unit or the division of the irrigable area, the project manager will proceed as directed in paragraph 32 of the General Land Office Circular approved April 29, 1912. Upon such application being filed, the project manager will either approve or disapprove the same, and if approved, proceed as directed in paragraph 33 of the said circular.

CONVICTED FOR STEALING WATER.

John F. Gabel was accused of stealing water on the Lower Yellowstone project, and after trial before a jury in the United States District Court sitting at Minot, North Dakota, was convicted and fined \$50.00. Considering that he probably had to pay somewhat more to his attorney, this method of getting water would not appear to be very profitable.

The case is of special interest from the fact that there was no United States statute relative to the matter. The United States statutes do provide, however, that where an act, made an offense by State statute, is committed on lands reserved or acquired for the exclusive use of the United States and over which the United States has exclusive jurisdiction, it shall be deemed an offense against the United States and the commission thereof can be prosecuted in the Federal Courts.

TRANSFORMATION OF THE GREAT PLAINS

"The Belle Fourche Valley in South Dakota, until a short time ago was remembered as the cowman's paradise," said Beyer Aune, the expert in charge of the Department of Agriculture demonstration farm in the valley, who is in Washington compiling his annual report.

"The advent of the big National Irrigation project marked the passing of the large herds and the festive cowboy, the picturesque round-up, and the high-jinks which usually accompanied the latter. Irrigation of the prairie ushered in the small farmer, who is not afraid of hard work, and who believes in the fertility of South Dakota soil. Farm homes now



Belle Fourche diversion dam; intake and sluiceway gates at the intake of main canal. The Belle Fourche river is entirely used up by this big canal.

dot a landscape long devoid of habitation, and wide vistas of alfalfa and grain have replaced the rolling stretches of grass-covered prairie.

"The Belle Fourche Reclamation Project is adjacent to and north of the Black Hills in South Dakota. The country is gently rolling, with considerable level areas traversed by several streams tributary to the Belle Fourche River. The country surrounding the project is an open cattle range. The water for irrigating the land is supplied by the Belle Fourche and Red Water Rivers. This water has been diverted into an immense reservoir formed by the construction of an earthen dam more than a mile long and 115 feet high at the highest point, it being one of the largest earth embankments of its kind in the country.

"From this reservoir canals carry the water north and south of the Belle Fourche River to the lands to be irrigated. Compared to the area to be irrigated, the water supply is ample while the certainty of supply and simplicity of arrangements offer unusual advantages in the work of reclaiming the valley. The cost of the water right is low as compared with that of other projects. On public lands that were filed upon prior to 1910 and private lands that were signed up previous to that date, the water right is \$30 an acre. On all public and private lands signed up since 1910, the water right is \$40 an acre. The maintenance for all lands is about 60

cents an acre a year. The project lies on both sides of the Belle Fourche River, beginning two miles east of the town of Belle Fourche and extending eastward for forty miles. Owing to the rolling character of the region, only 100,000 acres of this land is irrigable, of which 50,000 acres were public land, 45,000 acres private, and 5,000 acres owned by the State of South Dakota. Wherever possible, the land has been so divided as to include some dry land, but this cannot always be done, owing to the irregularity of the land surface. The irrigated portion of the farm unit usually varies from 20 to 80 acres. Farms adjacent to the Government townsite are limited to 40 acres of irrigated land.

"The average elevation is 3,000 feet above sea level. The climate is delightfully temperate as to extremes, with sunshine practically every day of the year. The dry, invigorating atmosphere is one of the most healthful features of the district and one of the greatest inducements offered to home-seekers. The precipitation averages about 15 inches a year and occurs largely during the spring and summer. The nights are always cool, and pleasant weather lasts until late in the fall.

"All the soil is very fertile and free from alkali and stone. There are two distinct kinds of soil in the valley. That on the south of the river is sandy loam, and on the north it gradually shades into a heavy clay. Little or no leveling is necessary in order to irrigate the land.

"Alfalfa and grains have been the principal crops of the valley and these crops with proper care make good returns. Three cuttings of alfalfa a year can be obtained and a total yield of 6 tons to the acre has been reported. The growing of alfalfa seed receives considerable attention. Yields of 3 to 5 bushels per acre are very common and some yields as high as 9 bushels have been reported.



Miner Wood's alfalfa field showing second stand ready for cutting. Belle Fourche Project, S. D.

"The yields of small grains are as good as on any irrigated project. Wheat yields from 30 to 45 bushels; oats, 60 to 120; flax, 15 to 25; and corn, 30 to 50 bushels. While these yields are not average, they have been obtained by the more careful farmers on the project and some have been obtained on new land. After the land has been in alfalfa for a

few years and a system of rotation of crops put into practice, varieties better suited to the locality introduced, and careful irrigation, there is no doubt that these yields can still be increased.

"The lighter soil on the river and south is especially adapted to potatoes, and sugar beets promise to be a good crop on any of the soil in the valley.

"While this section cannot be compared to the fruit growing sections of the West, excellent small orchards of apples, plums, and cherries are grown. All small fruits and garden vegetables of the northern latitudes can be grown successfully.

"Dairying should be one of the principal industries of the valley, and this last year several carloads of grade Holsteins and one of pure-bred Hol-



Wild Hay in Shock on the Barnett Ranch. Belle Fourche Project, S. D.

steins were shipped in. The winter feeding and fattening of stock receives considerable attention, and while the raising of hops has not yet been developed to any great extent, all conditions are in its favor. With the abundant production of alfalfa, grains, and root crops, live stock in some form should be the principal industry of the valley.

"The character of the settlers is well shown in the high educational standard maintained throughout the valley. The schools are well housed and instruction is given by competent teachers. High school certificates from any of the schools in the Black Hills district are accepted by any of the leading colleges. The State Normal School at Spearfish, is within easy reach and is not only an excellent training school for teachers, but is also one of the best preparatory schools for college and business in the district. The School of Mines at Rapid City, located in the center of a great mining region, offers unusual advantages to those who desire a technical training.

"With the nearing completion of the irrigation project, this valley will rank with the best agricultural regions of the country."

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.

"LITTLE LANDERS" TO BE AT PANAMA-CALIFORNIA INTERNATIONAL EXPOSITION.

"An acre of ground and a living" is not a joke in southern California, and the management of the Panama-California Exposition at San Diego in 1915 proposes to prove it to the satisfaction of every "Missourian" or other doubting Thomas. One of the unique and interesting places of the exposition will be that section devoted to the "Little Landers."

A tract, a dozen of which might be found within Balboa Park, has been set aside for this demonstration. There the visitor will find "farms" of one, two and three acres in extent, each with its home, its dependent family, and these families will be living there just as thousands of small home owners in this state are living, with no other source of income than from the tiny patch of land. While residing in the heart of the exposition grounds, they will be as entirely dependent upon the resources of these little tracts as are the many families in the state having no other resources than their insignificant land holdings.

Such "little Landers" are found all over California. They constitute the business backbone of many communities. It is a part of the business of the San Diego exposition to show what man can do when he applies brain and sinew to natural resources, not only in California, but anywhere in the United States and other countries where humanity is making progress.

SMUTS OF NEBRASKA CEREALS.

Bulletin No. 131 of the Nebraska Experiment Station is entitled "Smuts of Nebraska Cereals." This bulletin has been prepared to furnish information regarding the life-history and methods of control and prevention of the common smuts of the cereal crops of Nebraska. The losses due to these smuts in the aggregate are very great and it is hoped this bulletin will do much to start a general campaign against these diseases. The time and place of infection by each of these smuts is clearly indicated, since this forms the basis for successful treatment. The distinction between the covered and loose smuts of wheat and barley is explained and the radically different methods of treatment of the seed are described in detail.

This bulletin may be had free of cost by residents of Nebraska upon application to the Nebraska Agricultural Experiment Station, Lincoln, Nebraska. E. A. Burnett, Director.

SOIL SALVATION.

Land which is properly terraced, ditched, drained or irrigated brings just about whatever price the owner sets and, if he doesn't want to sell, better crops are his yearly reward. A valuable treatise on terracing, ditching, draining, irrigating, etc., called "Soil Salvation," is published by Bostrom-Brady Mfg. Co., 119 Madison avenue, Atlanta, Georgia, and will be mailed by them free to any of our readers upon request who expect to do terracing, ditching, draining or irrigating this spring.

TO MEMBERS OF NATIONAL DRAINAGE CONGRESS AND THE PEOPLE OF THE UNITED STATES:

Your Representative in Congress and the Senators from your State have been sent the following letter:

"Dear Sir:—We ask and urge your active support of the efforts of the National Drainage Congress to have the Congress of the United States create a National Drainage Commission with ample powers and funds immediately available to evolve and put into effect a comprehensive plan for

"1. The protection of the public welfare by the drainage and reclamation of the 75,000,000 acres of swamp and overflowed lands in the United States, and their utilization for agricultural purposes;

"2. The protection, by drainage and reclamation, of the public health, which is constantly menaced by the existence of these swamps;

"3. The protection, by levee construction and other means, of the people and their lives, their homes and their lands from floods, storms and tides;

"4. The protection of the financial interests of the United States, the various States, and the individual land owners, by co-operation and an equitable sharing of the expense of carrying out this plan, in proportion to the benefits received.

"Our next meeting will be in St. Louis and our aim is to assure you that there is no work you can do which will be of more value to your constituents, and that immediate action is a national demand.

"We also ask you to become a SUSTAINING MEMBER of our organization and to sign the enclosed application and return it, with check payable to the Treasurer.

"Will you please also give us a full expression of opinion on this subject, and permission to give your reply the widest publicity in your state and the country?"

If that letter meets with your approval, please write your Representative and Senators, asking them to actively support the National Drainage Congress.

The Reclamation Act has caused the expenditure of \$90,000,000 of government money in the reclamation of 3,000,000 acres of arid lands in the West, but has added many times this amount to the total wealth of the country. There is no more important question before the people of the United States than the reclamation of the 75,000,000 acres of swamp and overflowed lands and the regulation and control of our rivers. This is an engineering problem which can be solved, and though the expense will run into millions, the benefits to the country will be so tremendous that the expenditures will become comparatively insignificant.

We feel that it is the duty of every citizen of the United States to aid in this work, and we not only ask you to write the letters requested, but also urge you to join us in this work by immediately becoming a member of the National Drainage Congress, if you are not already such, in accordance with the terms of membership indicated on the enclosed application blank. Please make your check or money order payable to A. M. McLachlen, treasurer, but send same with application to this office.

Yours very truly,

EDMUND T. PERKINS, Chairman Board of Governors.

CONSTITUTION OF NATIONAL DRAINAGE CONGRESS.

Whereas, Our national prosperity, well-being and commercial supremacy rest now and must ever remain in the soil, and to maintain our prestige, support a rapidly increasing population and subserve the interests of the whole people there must be a complete and scientific utilization of our agricultural resources throughout the United States of America; and,

Whereas, There are now nearly 75,000,000 acres of unproductive swamp and overflow land, the greater part of which may be reclaimed and made productive, and 150,000,000 acres more which, although now productive, would be largely enhanced in value by drainage; and,

Whereas, There are undeveloped possibilities of transportation and marketing in connection with such reclamation projects by the utilization of drainage canals and existing streams for navigation; and,

Whereas, There is urgent necessity for the conservation of our agricultural resources through the restoration and preservation of our soil fertility, and the gathering and dissemination of information relating to these subjects; and,

Whereas, The swamp and overflow lands of the United States are a menace to public health and constitute, by reason of state line complications, a problem that one state alone cannot solve, it is the duty of the United States government, by the exercise of its powers for pacification and harmonization, to remove this menace by the drainage of said swamps; and,

Whereas, There is great need for a national congress having for its objects the study and solution of problems and the initiation and prosecution of plans pertaining to the above;

Therefore, There is hereby organized the National Drainage Congress.

The objects of the congress shall be (1) to promote and to diffuse knowledge concerning the reclamation of lands in all those states of the Union where drainage reclamation would be beneficial, and also concerning the artificial application of water to lands requiring irrigation in such regions; (2) to promote navigation by canals built for drainage and by improvement of the natural streams into which such streams are discharged; (3) to conserve and impound water for drainage, humid-land irrigation or flood protection purposes; (4) to conserve and control natural resources pertaining to agriculture; (5) to restore and preserve soils by rotation, fertilization and overflow of silt; (6) to remove the menace to the public health of the nation which the presence of undrained lowlands constitutes; (7) to facilitate conference and deliberation among the people of the country concerning drainage and related interests, especially to promote agreement and concerted action among those organizations interested in the conservation and proper utilization of our natural resources, to the end that united efforts may be toward agreed-upon ultimate results; and (8) to provide means for bringing the needs of the people and the country before state and federal governments.

Supreme Court Decisions

Irrigation Cases

ABANDONMENT.

To constitute an abandonment of riparian water rights by nonuser, the nonuser must have been continuous for the 10-year period constituting the statute of limitations for commencing actions to recover realty; L. O. L. § 6546, relating to the abandonment of the right to appropriate water by neglecting to use the ditch for a year, not applying. *Hedges v. Riddle*. Supreme Court of Oregon. 127 Pacific 548.

PARTIES TO SUIT.

Consumers of water taken by statutory appropriation from a public stream, who obtained their rights by contract from the appropriating company, have no direct right in the water which makes them necessary parties to an action against the company for an infringement of the right of appropriation of another appropriator, and a right to have them made parties was waived by a failure to object. *Biggs v. Miller*. Court of Civil Appeals of Texas. 147 Southwestern 632.

DRAINAGE DISTRICTS.

Act May 14, 1903 (Hurd's Rev. St. 1911, c. 42, §§ 204-209), requiring upper drainage districts to pay lower districts for benefits received by enlargement or improvement of ditches, or drains of the lower districts, etc., is unconstitutional, in that it gives the upper districts no remedy to recover from the lower districts benefits conferred upon them by improvements constructed by the upper districts and this deprives the upper districts of the equal protection of the laws. *Bay Island Drainage & Levee Dist. No. 1 v. Union Drainage No. 1*. Supreme Court of Illinois. 99 Northeastern 385.

INTERFERENCE WITH USE OF WATER.

Where a decree, in a suit to restrain defendants from interfering with plaintiff's use of three cubic feet of water from a creek for agricultural lands, granted to plaintiff all that he asked for, without an included provision that plaintiff should construct a gate in defendants' dam, such as would allow sufficient water to pass the dam to fill plaintiff's right, and that defendants should construct in the head of their ditch in the dam a head gate to regulate the flow of water in the ditch, the provision was unauthorized. *Masanarez v. Rominger*. Court of Appeals of Colorado. 127 Pacific 241.

CONDEMNATION UNDER RECLAMATION ACT.

The power conferred on the Secretary of the Interior by Reclamation Act June 17, 1902 c. 1093, § 7, 32 Stat. 389 (U. S. Comp. St. Supp. 1911, p 666), to condemn lands necessary for use in constructing irrigation works, is not subject to limitation by state statutes relating to the exercise of the power of eminent domain of the state, nor is its exercise governed by a state procedure requiring the necessity of the taking in each particular case to be determined by a local commission, but such necessity is a matter to be determined by the Secretary, whose decision is not reviewable by the courts. *United States v. O'Neill*. U. S. District Court, District of Colorado. 198 Federal 677.

Where a deed of conveyance describes real property as "lots three and four and the east half of the southwest quarter and the southeast quarter of section numbered eighteen in township numbered three, north of range numbered two east of Boise Meridian, Idaho, save and excepting therefrom the northeast quarter of the northeast quarter of the southeast quarter thereof, containing three hundred fourteen and thirty-three hundredths acres, * * * together with the water and water rights used in connection therewith, being the right to demand and receive upon the terms and under the rules and regulations prescribed therefor thirty-five inches of the water of the Nampa and Meridian irrigation ditch canal, formerly known as the Ridenbaugh canal, together with one hundred ninety-two shares of the paid-up water stock of the New York Canal Company, Ltd., aggregating one hundred eighty-eight and six-hundredths inches of the said water," and said deed also contains the following provision, "together with all and singular the tenements, hereditaments and appurtenances thereunto belonging or in any wise appertaining, * * * to have and to hold all and singular the above mentioned and described premises together with the appurtenances unto the party of the second part," such deed clearly shows the intent of the parties to convey the water rights used in connection with said land and described in the conveyance, and that such description does not include other water rights appurtenant to said land, and not described. *Paddock v. Clark*. Supreme Court of Idaho. 126 Pacific 1053.

IRRIGATION CONTRACT.

Complainant, a state corporation, made an appropriation of the greater part of the water of the Colorado river for the irrigation of lands in Mexico and the Imperial Valley in California, which were then public lands owned by the United States and the state. The lands were desert lands, and there was no other source from which they could be irrigated. Complainant's canal commenced in California, extended into Mexico, and back across the boundary. It organized a company in Mexico to have charge of that part of its works, of which it owned all of the stock. It also later organized subordinate mutual companies, each of which was to furnish water for the irrigation of certain designated lands in the valley to its stockholders who were required to be owners of such lands and to purchase one share of stock for each acre to be irrigated. They were also required to pay rates for the water which was to be supplied by the Mexican Company. *Held*, that a contract between complainant and such local company, by which the latter agreed that complainant should have all of its capital stock with the right to sell the same to settlers at such prices as it might fix and keep he proceeds, the effect of which was to enable complainant to charge such settlers for the water rights to their lands, was void for want of consideration. *Imperial Water Co. No. 5 v. Holabird*. U. S. Circuit Court of Appeals. 197 Federal 4.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.

SOLVING THE DRY-FARMING PROBLEM.

By Raymond Olney, Traction Farming Expert,
Member American Society Agricultural
Engineers.

In certain sections of the country where the rainfall is only a few inches the practice of dry-farming is next to impossible without the use of mechanical power. In these regions the farm tractor has made it possible for the farmer to grow successful crops where he was unable to do so before. Many have found by actual experience that the tractor holds the key to the situation when it comes to producing surer and better crops in dry-land agriculture.

The farm tractor, particularly the oil-burning engine, has solved many farm problems in spite of the short period of its development. To the farmer on the semi-arid plains it is simply a question of a



25 H. P. Rumely Oil-Pull Tractor pulling 4 Spaulding deep Tilling machines and drag.

crop or no crop. If he has the power and the necessary equipment, he is master of the elements.

One of our greatest natural resources is soil moisture. To conserve every ounce of rainfall results in the biggest crop yields. Dry-farming conditions are such that when work is needed it must be done very rapidly. Here lies the advantages of using traction power. It enables the farmer to do his work speedily and keep the upper hand of unfavorable conditions. It makes possible effective conservation of moisture.

There are sections of the country that are considered too dry for agricultural purposes without the aid of irrigation. The fact is that it is not so much the lack of rainfall as it is the condition of the soil. The soil is of such a nature that rain cannot penetrate it. The consequence is that it runs off and its usefulness is lost. It makes little difference whether the rainfall is 10 or 20 inches. If the soil is not properly prepared to absorb and hold it, it cannot be expected that a crop can be grown.

The solution in such a case, as it is in many others in dry-farming practice, is deep tilling. It not only gives an excellent, large seed bed for the

roots of the plants, by offering them a larger feeding ground to grow in, but also provides a larger reservoir for the storage of water. This must be done so that plants will receive the necessary moisture during periods when there is a scarcity of rainfall.

There are times when big storms come and if the soil is not in condition—if there is no moisture reservoir—there will be an enormous amount of surface water which will run off and not penetrate the soil, when with proper tillage it might have been saved. In some instances deep plowing has proved a safeguard from heavy damage by flooding. This is due to the fact that the land absorbed the rainfall and prevented harm being done by the excessive surface water.

But deep plowing, as pointed out before, takes a large amount of power. Hauling deep-tillage machines 10 to 15 inches deep is pure drudgery for horses and mules. While it is possible to plow deep with animal power it is not practical. Especially is this true in dry-farming sections where plowing must be done to a large extent in the hottest kind of weather. Horses are unable to stand the high temperature and they soon become exhausted. Besides large teams are necessary for hauling the machines and they are also very inefficient and difficult to manage.

The tractor, on the other hand, has unlimited capacity and endurance. It works best in the hottest weather and, furthermore, it is tireless. One man can handle it as easily as he can a team of horses. It enables the farmer to prepare the seed bed rapidly and to conserve moisture with very little loss, and it also insures larger crops.

The great value of deep plowing was very well shown by a demonstration made in Colorado by two oil-pull tractors, manufactured by the M. Rumely Company, La Porte, Indiana, hauling Spaulding deep-tilling machines. It was given in the hardest soil in Eastern Colorado—dry adobe and original soil. It had been tramped under foot for ages by wild buffalo, antelope and domestic animals so that it was packed so hard that in turning the furrow the first three or four inches resembled shale. It was so very dry that great clouds of dust were raised by the action of the plows.

The previous experience by one of the best authorities in dry-farming and deep tillage, Mr. E. R. Parsons, had proved that large crops could be obtained in this soil simply by deep plowing and without the aid of irrigation. His methods had secured successful crops for him when others had made dismal failures. The whole problem seemed to lie in providing a sufficiently large reservoir to absorb and retain as much of the rainfall as could be done.

Plowing started with a 15-tractive, 30-brake h. p. oil-pull tractor, pulling three Spaulding deep-tilling machines. It was a hard, difficult proposition, but the tractor never balked or slackened its pace. It kept on cutting and turning that hard adobe sod at an average rate of six acres per day. The machines maintained a depth of fourteen inches at all times. In all, it plowed eighty acres, or an equivalent of traveling 470 miles.

Soon after the demonstration began a big storm came up and there was so much rain that it was

necessary to get another tractor to prepare the ground for the crop. A 25-horsepower, 45-brake h. p. oil-pull tractor was put to work in the same field. This engine hauled four Spaulding deep-tilling machines, a heavy clod crusher and a part of the time a harrow. With this equipment clods were broken up as soon as the furrow was turned, and the soil was left in an excellent condition for seeding. An average of eight acres was plowed each day.

It was necessary to load each tillage machine with several hundred pounds of weight in order to make the discs penetrate to the desired depth. This added very considerably to the draft of the whole outfit.

The cactus and other growth were completely buried by the deep-tillage machines and the soil was left in such a condition that it readily absorbed the rainfall. In order to show the results of deep tillage, a heavy rainstorm came up during the demonstration. All the rain that fell on the plowed ground was retained. On the unplowed ground practically all of it ran off into the gullies and streams, doing considerable damage.

The cost of plowing with mechanical, com-

CURRENT COMMENT ON THE U. S. RECLAMATION PROJECTS.

The enterprising young city of Rupert on the Minidoka project in Idaho is claiming the unique distinction of having more houses, both business and residence, heated by electricity than any other city in the United States. Electric ranges for the kitchen are also being installed in many homes. All of this has been made possible by reason of the fact that the electricity as a by-product of the Government work is supplied at a very low rate to the consumer. In 1904 the Minidoka project was a sage brush desert uninhabited and remote from transportation. Today its 1,500 farms are practically all occupied; it has three growing towns and a railroad.

The farmers on the Huntley project, Montana, have filed articles of incorporation for a farmers' telephone company. The capital stock of the company is \$10,000 divided into 1,000 shares. It is understood that three private lines will be taken over and consolidated with one central exchange. Branches will radiate all over the project with Worden as the central point.

Elmer Eiker, whose remarkable success as a farmer on the Huntley project has been the subject of comment from his first year on a homestead, continues to add to his laurels as the prize winning farmer of the Yellowstone Valley. During the past two years Mr. Eiker, who was formerly a locomotive engineer, has won a total in prizes of \$1,045, of which \$730 was won this year at the State and County fairs. His specialty is corn, but he has obtained a prize for sugar beets also.

The encouraging prospect that Yuma is to be on the ocean-to-ocean highway for automobiles has aroused much civic pride on the part of its citizens. There is talk of a fine bridge across the Gila River and another across the Colorado, and the country and towns are awakening to the importance of building a first class system of roads through the valley.

Settlers on all the projects of the Northwest and on several projects in other sections are awakening to the fact that more live stock should be kept on the farm and fed on the forage grown there, and that more attention should be given to dairying. The purchase and feeding of sheep this winter on the Belle Fourche and Minidoka projects and the introduction on the Shoshone and Boise projects of a number of grade Holstein cows are indications of this fact.

The average market value of sugar beets on the Huntley project this year is \$6 per ton. This means very profitable returns to the growers and it is not surprising that each year shows an increasing acreage in this crop. Diversification of crops and the growth of dairying are encouraging signs throughout this project.



15 H. P. Rumely Oil-Pull Tractor pulling 3 Spaulding deep Tilling machines.

pared with animal power, is very interesting indeed. The fuel and water expenses for the tractors amounted to \$1.52 per acre each. The total cost, including interest on the investment, depreciation, labor, etc., added to the above expenses, amounted to \$2.63 per acre. While this is much less than the cost would have been with horses, it is higher than it would have been if good weather conditions had prevailed. It rained almost every day for two weeks while the work was progressing, consequently this added considerably to the expense of performing the work.

In spite of the unfavorable weather conditions, the cost was much less than if horses had been used. One man who has plowed three or four hundred acres with deep-tilling machines hauled by mules or horses states that the cost on an average is \$6 per acre—more than twice as much as for

(Continued on Page 122)

Reclamation Notes

CALIFORNIA.

The California & Arizona Land Company, whose main office is in Los Angeles, is planning to develop water on a large tract of land near Monolith.

A. G. Chatom and H. A. Dunn of Turlock have been awarded the contract for the construction of an irrigation system at Brentwood, in Contra Costa county, which will cost approximately \$200,000 and will be similar to the system so successfully installed and now in operation at Patterson, Stanislaus county. It is expected that the project will be completed within a year.

The Railroad Commission has rendered a decision granting the application of the Moulton Irrigated Lands Company for authority to issue bonds in the sum of \$250,000. The company owns lands and a water system in Colusa, Glenn and Sutter counties.

The Turlock Irrigation District has filed condemnation proceedings in the Superior Court against the Louis Hickman corporation, which owns lands in the vicinity of Denair. The district has planned for a canal connecting the high line canal with the Turlock main canal, and a part of the rights of way sought are over the Hickman lands. In the complaint it is set forth that the district has offered the owners of the Hickman lands a reasonable sum, but the offer has been refused. Therefore, the district asks that there shall be an assessment of the value of the land and condemnation of that portion needed for rights of way.

The Solano Irrigated Farms have filed articles of incorporation. The life of the corporation is fixed at fifty years and the capital stock is \$7,500,000, divided into 75,000 shares of a par value of \$100 each. Of the capital stock, \$2,000,000 is preferred. The company is the outgrowth of recent purchases by San Francisco and Eastern capitalists in Solano county, and more than 100,000 acres of land will be developed by this company. The incorporators and directors are Frederick Stencil, A. von Bortsel, E. Salomon, Oscar Samuels, William Coates, William P. Dixey, B. Harcourt, W. P. Taylor, Jr., and E. Soderstrand, all of San Francisco. The principal office of the company is located in San Francisco.

An irrigation company which plans to bring water to 2,000 acres of land in the Carpinteria district has been formed in Carpinteria, the project being to construct a reservoir in the hills, half a mile from the Casitas road. The first cost will be about \$40,000. Four hundred acres have been purchased in the canyon above the Webster place. A dam will be built half a mile above the S. I. Jamison ranch, and the water will be brought down in iron and concrete pipes 16 inches in diameter. From the mouth of the canyon the laterals will extend in either direction and supply water to that entire section of the valley. There has been 360 acres contracted for so far. Those interested in the project are C. B. Franklin, John Bailard, S. E.

Beckstead, B. Bailard and Ed. Bailard, all of Carpinteria.

Articles of incorporation have been filed by the Jamison Land & Water Company, capital stock 52,300; principal place of business, Colusa; object, to buy, sell and irrigate land. The incorporators are J. L. Mendenhall, I. P. Iverson, Ross Nissen, N. Mortenson and Charles Keane.

Ground has been broken near Brentwood for the irrigation system of the Balfour-Guthrie Company, covering 12,000 acres of land. The contract for the main ditch has been awarded to Edward Malley of San Francisco. The estimated cost of the system is \$500,000.

COLORADO.

The Grand Valley Water Users' Association, at a recent meeting, voted to issue \$15,000 in bonds to take up all debts of the corporation and get its affairs in shape for the completion of the High Line canal. This is the company that has the contract with the government for the land to be watered by the \$5,000,000 canal.

The Las Animas Irrigated Land Company, which has recently been incorporated, has secured a tract of land and will sink twenty wells, install pumping plants to be run with electricity, and in forty-acre tracts place this land in the hands of actual farmers.

Three hundred and sixty thousand acres of land in Southwestern Colorado and upwards of 100,000 in Southeastern Utah will be brought under cultivation through the signing of contracts by Henry L. Doherty & Company of New York for the underwriting of between \$6,000,000 and \$8,000,000 of bonds, the proceeds of which will be utilized in the construction of a large irrigation system. Settlement will be made under the Carey Act, and the water will cost between \$25 and \$30 per acre. Two years will be required to complete the work. Water will be taken from the Dolores river at a point about twelve miles below the town of Dolores, in Dolores county, and will be carried into Montezuma county. To impound the water a dam 239 feet high will be built, making a lake that will extend to within a mile of the town of Dolores. To get the water into the main canal a tunnel 7,009 feet long will be constructed. Application for the segregation of the land was made before the state land board some months ago by Senator West of Durango and Frank E. Gove, former senator from Denver, representing the promotion syndicate, and was immediately granted when the feasibility of the project was shown.

Articles of incorporation have been filed by the Russell & Thatcher Ditch and Reservoir Company. The company is incorporated for \$10,000, divided into shares of \$10 each. The place of business will be in Pueblo. The object of the company is to maintain and construct reservoirs, laterals, dams and canals and flumes for water storage for irrigation and domestic purposes; also to purchase live stock to stock the land to be irrigated. The headgates of the main canal, which will be 23,000 feet long, will be on the Huerfano river.

Articles of incorporation have been filed by the Rocky Mountain Development Company, with

principal offices in Pueblo. The company is incorporated for 100,000 shares of stock of the par value of \$1.

Milton Smith, attorney for the Denver Reservoir and Irrigation Company, has received a telegram from Paris to the effect that a French company will put up the necessary money for the completion of the irrigation system. The Denver Reservoir and Irrigation Company is one of the largest in the West.

The officers of the Central Colorado Power Company are in a quandary as to how to obey an order recently given them by the Interior Department, which told them to remove the Shoshone power plant tunnel off the government domain. The company, in order to build its power plant at Shoshone, diverted the waters of the Grand river around a mountain side through a tunnel and then dropped them down a vertical tunnel. The tunnel through the mountain is on government land. The government and the company has had some trouble over rentals, and the government has now ordered the removal of the tunnel.

It is reported that a firm of New York bankers are investigating the Greeley-Poudre irrigation district with a view to financing and completing it at once. This project embraces 125,000 acres of the most fertile land in the northern part of the state. The failure of the Denver Reservoir and Irrigation Company temporarily embarrassed the sale of its bonds. The interest has been defaulted on one issue of \$2,500,000 of bonds. The entire bond issue originally authorized by the company, in which D. A. Camfield of Greeley was extensively interested, amounted to \$5,100,000.

Word recently received from the bondholders' committee of the Pueblo-Rocky Ford Irrigation Company authorized Receiver Devine to expend \$50,000 in completing the system in a thorough manner so that water can be run on the lands for all time. This action by the bondholders is most creditable and should be evidence that this large body of land is going to be irrigated and in time brought under intensive cultivation.

MONTANA.

The Secretary of the Interior has authorized the Reclamation Service to award the following contracts for the construction of about forty-six miles of the Vandalia south canal of the Milk river irrigation project: To J. E. Hilton of Billings, Montana, schedules 1 and 3, involving the excavation of approximately 583,550 cubic yards of material, contract price \$118,150; to Charles Wilhite of Boise, Idaho, schedule 2, involving the excavation of about 302,550 cubic yards of material, contract price \$51,700. The work is situated on the south side of Milk river, adjacent to the main line of the Great Northern Railway, and is in the vicinity of Vandalia, Tampico, Glasgow and Nashua, Montana.

A petition has been filed with the clerk of the District Court with a request that the "Hysham Irrigation District" be organized under the Montana laws. The petition recites that there is approximately 6,000 acres of land lying south of Hysham which may be irrigated from the Yellowstone river. It is the intention to take the water from the river

at a point west of Hysham by means of a pumping plant or other means of lifting the water. The petition is signed by a large number of landholders and will be heard by the District Court at Forsyth in the near future.

Articles of incorporation have been filed by the Miles City Canal and Irrigating Company. Capital stock of the company is fixed at \$100,000. The principal office of the company, of which W. B. Jordan is president and J. B. Collins secretary, is located at Miles City.

A petition has been filed in the District Court by H. D. Kremer, signed by a majority of the landowners, asking for the creation of the "Gallatin Irrigation District." If the district is created, it is proposed to have the water on the fields in 1914. The ditch would transform 2,964 acres of land on the bench south of Three Forks and Willow creek between the Madison river and Willow creek from desert and grazing land into a fertile grain producing section.

The Yellowstone Valley Colonization Company has filed articles of incorporation and the company will sell land and enter into many other enterprises. The principal place of business is the city of Forsyth and the term of the incorporation is forty years. The directors are George Heaton, R. W. Heaton and James Denegre of St. Paul, Minnesota; James D. Connors of Dubuque, Iowa; J. H. Foster, William Wratten, G. R. Huntington, J. T. Gillick and W. E. Baird of Minneapolis, Minnesota. The capital stock of the company is \$1,000,000, with \$480,000 actually subscribed.

The electrical pumping plant of the Prickly Pear irrigation project at Helena was started February 2, and water turned into the ditches for the first time. The machinery performed perfectly and to the entire satisfaction of the engineers having the equipment in charge. The plant will be operated until every part has been given a thorough test, and will then be closed down until May 1, when it will go into regular service delivering water during the irrigation season. The entire construction, including twenty-six miles of main ditches, flumes, intakes, pumping plants and distributing system, was completed within seven months from the time work was started.

P. E. Newcomb of Billings, representing Eastern capital, has purchased the bond issue of \$100,000 of the Lockwood irrigation project, and he also has the contract for the construction of the system. The plant is to be complete and thoroughly up-to-date in every respect and is to be completed by July 1, 1913. The system will consist of a pump house, located on the Yellowstone river east of Billings, from which the water will be raised to two ditches, one of which will be at an elevation of about 60 feet and the other to about 100 feet. The land to be put under the ditch by this system comprises some of the richest land in the state of Montana and all lies within six miles of Billings on what has been known as "Poverty Flat."

UTAH

Samuel O. Lowe of Summit has filed a petition with the state engineer for water right to irrigate 40 acres of land in Iron county.

Within sixty days the great Strawberry valley irrigation project built by the U. S. Reclamation Service will be complete and ready to turn water into Utah valley for the irrigation of thousands of acres of rich soil. The only matter that is unsettled now is the question of completing the distributing canals. When the government began the construction of the project it was agreed that the water from the Strawberry river should be delivered at the mouth of Spanish Fork canyon, or, in other words, at the mouth of the five-mile tunnel which has been bored through the Wasatch mountains to carry the water into the Utah valley. It appears now that there was a misunderstanding between the water users and the reclamation service about the matter and that the water users supposed that the distributing canals were also to be built by the government. As a result the majority of the canals have not been started and with the completion of the project almost at hand there has been little preparation made for the handling of the water.

According to William Glasmann, president of the Ogden Reservoir Company of Ogden, the Union Pacific railroad, one of the parties to the condemnation suit recently started by the irrigation company, has agreed to turn over its land at whatever price was paid for other property included in the reservoir district. It is declared that the railroad company has no desire to retard the work on the proposed dam. The McGillis Construction Company of Salt Lake City have been awarded the contract for construction of the project and work has been commenced in South Fork canyon.

Articles of incorporation of the Utah Conservation Company have been filed with the secretary of state. This company proposes to build the largest irrigation project ever undertaken in the state of Utah. The company organized at this time is only a temporary or promoting organization, capitalized at \$100,000. When the main company is formed it will be capitalized for millions of dollars. The purpose of the temporary company is to facilitate the securing of water rights and the consumption of contracts with farmers. Lewis S. Hills of Salt Lake City is president of the Utah Conservation Company; John Dern, first vice-president; W. W. Armstrong, second vice-president; C. H. Carlquist, secretary; O. C. Beebe, treasurer, and Thos. Cutler, Chas. Nibley, A. W. McArthur, W. R. Wallace, Thos. L. Allen, Geo. F. Gibbs and B. F. Bauer additional directors. The tract to be reclaimed embraces 260,000 acres of dry land in Utah, Salt Lake, Davis, Weber and Morgan counties. The project was first launched a year ago at a mass meeting of prominent citizens from many parts of the state of Utah. Water for irrigation purposes will be taken from Weber and Provo rivers.

The State Conservation committee, in connection with the national commission in charge of the Strawberry project, has made a proposition to the Juab county land owners, whereby 15,000 to 25,000 acres of the water to come through the newly completed Strawberry tunnel may be secured by them providing they agree to purchase the water when it is delivered on their farms, and in the meantime furnish security in the way of their lands as proof of their good faith, so that the government will be

justified in completing a system of canals to carry the water into this region. A committee composed of farmers and land owners has been appointed to make an immediate investigation of the matter.

Thirty thousand acres of land in the Uintah basin will shortly be brought under irrigation. This decision was arrived at by a mass meeting of settlers of Blue and Purple benches held recently at Duchesne. A committee consisting of Wm. H. Smart of Roosevelt, chairman, Ephraim Lambert and R. S. Collette of Roosevelt and Harden Bennion of Salt Lake had been appointed to investigate conditions and reported favorably regarding the scheme. After an exhaustive examination the committee recommended that a channel be dug from Rock Creek which would irrigate 30,000 acres. The channel will furnish an ample supply of water, according to the committee. The meeting accepted the report and it was decided to amalgamate the three old irrigation ditch companies into a new organization. Work will be commenced in the near future.

F. B. Hammond of Moab has made application to appropriate ten second feet from La Sal Creek, San Juan county, for irrigation purposes. Mr. Hammond has 640 acres of land which he intends to irrigate.

WASHINGTON

A meeting of the owners of property above the canal east and northeast of Sunnyside was held late in October to discuss the feasibility of forming an irrigation district and developing the land. It is proposed to install a pumping plant and buy water from the government.

Development work on the Wapato irrigation project is being pushed with vigor this fall in an effort to get enough done before the ground freezes that the project may be completed early next season. J. J. McNerny, a Wenatchee contractor, is in charge of the construction work. Water will be taken from Antillon lake.

D. C. Henney, an irrigation engineer of Portland, Oregon, has been engaged by Pasco capitalists to make a survey and ascertain the feasibility of what is known as the Glade project. This project is intended to cover and bring under cultivation a large number of desert claims and enable the entrymen to hold their claims. If the project is pronounced feasible by the surveyor the project will be taken up and it is probable assistance will be secured from the government.

James Mossman of Yelm, head of the Yelm Irrigation Company, reports that work has been started on their project which will reclaim a large acreage near Yelm.

Surveys for an irrigating canal, starting two miles south of Roza, in the Kittitas canyon and running 30,077 feet down the canyon to Pomona Heights, have been completed by Chief Engineer W. R. King, of the North Yakima & Valley railroad, according to maps filed for record with the county clerk. The capacity of the canal will be 1,800 cubic feet of water per second, and it is reported that the Northern Pacific railroad company, of which the North Yakima & Valley R. R. is a branch, intends to irrigate a large area of land owned by that company in the lower valley.

WHEAT.

The Agricultural Experiment Station of New Mexico has recently issued a bulletin on "Wheat Growing Under Irrigation," which gives the results carried on during the last ten years. Interested parties may secure this bulletin by addressing the Director of the Experiment Station with a request for bulletin No. 84.

The average yield of wheat in New Mexico is 23 bushels per acre; the average yield in England is 30 bushels and in the United States is but 13. The yield in New Mexico can be materially increased by better cultural methods and the use of better seed.

It costs about \$24.50 to grow an acre of wheat in the Mesilla Valley. This is, however, under irrigation where the yield is much above that of the average of the state (23) as given above. The average yield for 24 varieties for 10 years on the Station farm is 45 bushels. This yield, with wheat at \$1.00 per bushel, gives a good return above the cost of growing.

Use good, clean seed. The Station has had the best results with Rodi and Hedgerow varieties, but all of the varieties tested have done well. Only one averaged below 37 bushels.

Prepare the seed bed carefully so as to reduce the clods and secure a fine tilth.

Use about a bushel and a half (90 lbs.) of seed per acre and put it on as evenly as possible.

Give the seed the formalin treatment for smut. This is cheap and effective and will not injure the vitality of the seed. The Station has a press bulletin on this subject which will be furnished on request.

Sow winter wheat early in September. Sow spring wheat any time from October to the last of February. Scarcity of irrigation water may limit the time to early spring.

Letters of inquiry are given careful attention.—E. P. Humbert, Station Agronomist, New Mexico College of Agriculture and Mechanic Arts.

THE "RAILROAD RED BOOK."

A comprehensive as well as conservative review of the agricultural, mining, industrial and commercial conditions, as they exist in the states of Colorado, Utah and New Mexico, is contained in the annual review number of the "Railroad Red Book," just issued by the passenger department of the Denver & Rio Grande Railroad. Governor Ammons of Colorado and Governor Spry of Utah have contributed instructive articles on the 1912 progress of their respective states. Mr. C. J. Blanchard, statistician of the United States Reclamation Service, writes on irrigation projects. The presidents of the Colorado and Utah agricultural colleges have made valuable contributions on the agricultural resources of the Rocky Mountain region. Mr. D. W. Working, of the Agricultural Department at Washington, writes interestingly on farm management.

The value of the principal products of Colorado is as follows: Agricultural, \$79,905,580; live stock, \$34,321,000; mining, \$69,136,710, and manufacturing, \$145,524,621. The mineral output of Utah, exclusive of coal, amounted to \$45,454,977.

READY NOW: THE PRIMER OF HYDRAULICS.

By Frederick A. Smith, C. E., Hydraulic Engineer.

This new book is a splendid volume of over 200 pages of absolutely new matter pertaining to the subject of Hydraulics and its allied branches. All the subjects treated of are handled in a simple and practical way to make them of use to the men who have been unable to obtain a college education, but who are successful practical men in fields where they require a knowledge of the principles of Hydraulics and instructions how to solve their problems in a simple and satisfactory way. This book is indispensable for anyone engaged in works relating to Hydraulics, Irrigation or Drainage; it is primarily designed for the practical man in the field, but will be equally welcome to the trained Hydraulic Municipal and Railroad Engineer especially, on account of the many valuable tables compiled by the author, which will save a tremendous amount of time in computations.

Condensed Table of Contents.

Article	I. General Properties of Matter.
Article	II. Algebraic Principles.
Article	III. Geometrical Principles.
Article	IV. Trigonometry.
Article	V. Mensuration of Plane Figures.
Article	VI. Mensuration of Solids.
Article	VII. The Principles of Mechanical Forces.
Article	VIII. The Three States of Matter.
Article	IX. General Hydraulic Principles.
Article	X. The Coefficient of Roughness.
Article	XI. How to calculate n .
Article	XII. Explanation of the "C" Tables.
Article	XIII. Open Channels—Problems.
Article	XIV. Closed Channels—Problems.
Article	XV. Pipes Flowing Full Under Pressure.
Article	XVI. Loss of Head by Enlargement of Channel.
Article	XVII. Subdivisions of Channels.
Article	XVIII. Loss of Head at Entrance to Pipes.
Article	XIX. Ditches.
Article	XX. Ditch Tables and Their Applications.
Article	XXI. Flow Measurements.
Article	XXII. The Use of Logarithms.

Tables.

Fourteen tables giving the factor C for all cases of channels for a coefficient of roughness; n varying from .008 to .050, inclusive, for channels having a hydraulic radius from .01 ft. to 900.0 and for slopes varying from 0.1 to .000025, thus practically covering every possible condition.

Tables of square roots of numbers used for r and s .

Table of Hydraulic Elements of the Circle.

Table of Hydraulic Elements of Composite Section.

Table of Areas and Circumferences of Circles.

Table of Hydraulic Equivalents.

Table of Weights of a Cubic Foot of Various Substances.

Conversion Table of United States and Metric Measures and Weights.

Table of Squares, Cubes, Square Roots and Cube Roots.

Table of Logarithms.

Table of Natural Sines and Cosines.

Table of Natural Tangents and Cotangents.

Conversion Table, millions of gallons in 24 hours in other units.

Table of sizes of pipes or cylindrical conduits required for the flow of given quantities of water at given velocities.

Most all of these tables have been originated and computed by the author and have been checked in practical work and found to be correct, so that the tables alone will be worth many times the cost of the book.

The price of the book has been placed as low as is consistent with the superior quality of the work and it may be obtained on the following terms: \$2.50 a single copy, cloth bound; if order is sent with a new subscription to IRRIGATION AGE or a renewal subscription, the book will be sent and THE IRRIGATION AGE one year for the sum of \$3.00.

Postage is included in the above prices.

Send in your orders early, so as to receive early attention.

Send all orders and remittances to

Irrigation Age, 30 N. Dearborn St., Chicago.

RURAL ROAD GRADER AND IRRIGATION DITCHER.

C. D. Edwards, of Albert Lea, Minn., has just issued his eighth annual catalogue of the Rural Road Grader and Irrigation Ditcher; Edwards' new reversible steel road grader and the rural road drag, which contains half-tones of the machines mentioned, and descriptive matter concerning same.

The rural road grader and irrigation ditcher is a machine of large capacity, extreme strength and durability. It has a half reversible blade, which can be set at any angle to move earth either three, four or five feet.

Considering first cost, operating expenses and

me has proved more than satisfactory. In fact, it has saved me an average of between 60 and 75 pesos a day. When labor is so scarce as this year, a machine like yours that does the work of over fifty men, is indispensable in a country where irrigation is necessary.

The rural grader is very light and four Mexican mules (which are rather small) can pull it without an effort and it does not slide as I have had other machines do before I bought yours.

The work that your machine is called to do this year is the leveling of over ninety miles of high checks which measure three yards at the base and one yard and a half in height and to dig over sixty miles of small irrigation ditches. At the rate I am going I firmly believe we will have the work finished in a very short time with great saving.

Very respectfully yours,

A. PERELLI-MINETTI.



EDWARDS RURAL ROAD GRADER AND IRRIGATION DITCHER.

maintenance, the manufacturer of the rural road grader claims that it will build and repair more roads at less cost than any other grader made.

Special attention has been given to the arrangement of the rural grader for making open farm ditches, rice irrigation ditches and levees. Also V bottom and other forms of dry land irrigation ditches, making it unequalled by any other machine for doing this hard and difficult work.

A machine that is a success on ditch work, like the rural grader, can also be depended on for ordinary earth moving, such as road work and the like.

The letter reproduced herewith is a fair sample of the many being received by the manufacturer.

Torreón, Coah, Nov. 15, 1912.

C. D. Edwards, Albert Lea, Minn.

Dear Sir:

It pleases me to state that the rural grader you sent

DEVELOPMENT AT SIMMS, MONTANA.

Simms, Montana, not on the map in 1907, today boasts of three large general stores, 4 lumber yards, an elevator, newspaper, drug store, tailor shop and gents' furnishing, barber, blacksmith, hotel, and a new hotel and a hardware store under construction. The high school course this year has nearly 100 scholars enrolled. Contracts have been signed by the farmers nearby to plant 200 acres in cabbages, and a cold storage plant of 1,000 ton capacity is to be erected to store the crop.

In 1914 a beet-sugar factory will be erected by the Darley Co-operative Sugar Beet Company. The new railroad has given a great impetus to all kinds of business, and the future prospects of the town are very flattering.

DISCING BEFORE PLOWING

By F. D. BLAKE
Deere & Co., Moline, Ill.

Notwithstanding the fact that the disc harrow trade has been growing rapidly, the disc harrow is not being put to as many uses as it should be.

Careful study of the following will show that there are enough profitable ways to use this implement, which are not now being practiced, to double the disc harrow trade.

Many practical experiments, and a good deal of scientific study, just recently, has proven the advisability, and, in fact, the absolute necessity, from an economic standpoint, of properly preparing the soil before plowing.

Nature stores moisture in the subsoil which is brought up to feed the plants by capillary attraction. Capillarity is only perfect when the soil is well pulverized and compact—that is, the land must be

free from lumps and pulverized so that there will be no large air spaces to retard the process of bringing the moisture from the subsoil to the seed bed proper.

Stubble, heavy layers of manure, corn stalks or rubbish turned under by the plow is a hindrance and the capillary water stops at the break made at the bottom of the furrow, consequently the plants suffer because they must depend entirely on the water in the seed bed proper—they can not get the moisture from the lower subsoil.

This condition is obviated by discing before plowing. The disc not only pulverizes the ground, thereby making a compact contact between the furrow slice and the bottom of the furrow, but all vegetation, manure and

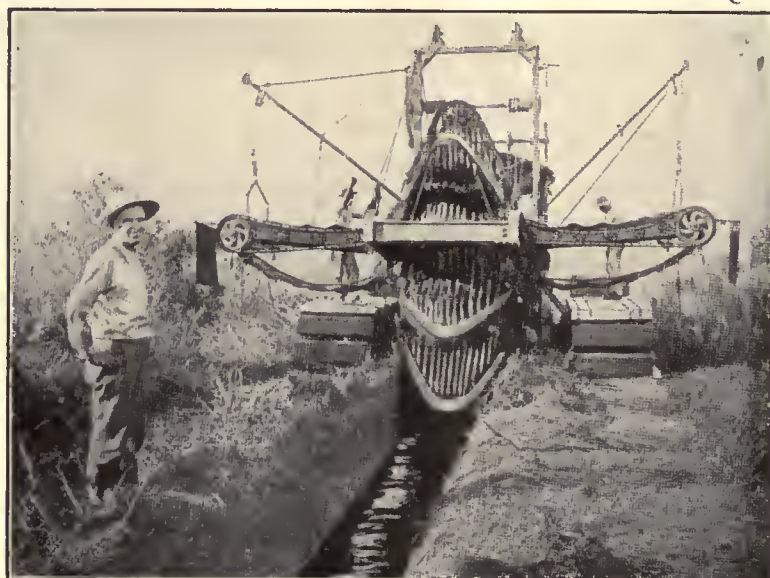
trash that was on the surface is cut up and thoroughly worked into the seed bed.

During seasons of scant rainfall discing immediately after cutting the grain forms a dust or fine mulch on the top of the land. It will then absorb water, as well as prevent the escaping of what

(Continued on page 123.)



Cut Down Your Reclamation Costs With a BUCKEYE OPEN DITCHER



¶ This illustration shows the Buckeye Open Ditcher in actual operation in the Everglades of Florida, where it has already reclaimed vast tracts of waste land at a great saving in cost over hand labor.

¶ The Buckeye has enabled contractors and land owners to cut their reclamation costs down to the minimum because it does the work better, faster and cheaper than the obsolete hand labor method.

¶ It is a machine that is built to handle the most difficult kind of reclamation and irrigation work. It is equipped with broad apron tractions that carry it over the softest and soggiest kind of ground.

¶ The Buckeye is made in a number of sizes, cutting ditches from 2½ to 12 feet at the top. It digs every ditch uniform size and perfect to grade.

Write today for catalog No. 26

It explains in detail the simplicity, efficiency and economy of the Buckeye.

The Buckeye Traction Ditcher Co., Findlay, Ohio

**This Cot
Weights
Only
30 Pounds**

**Can Be Set
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Seconds**

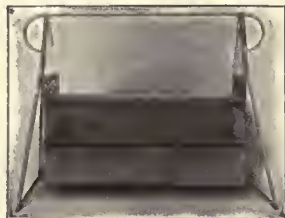


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FOR OUT-DOOR SLEEPING

Designed for Campers, Fishers, Hunters, Miners, Prospectors, Ranchmen and Invalids

There is no more popular or useful article of porch or lawn furniture made than the ENTERPRISE COUCH HAMMOCK. It can be used as a couch, settee, hammock or an out-door bed and is so thoroughly well constructed that it is almost indestructible.



Enterprise Couch Hammocks

The "Kumpak" Cot



Ideal because of its simplicity. Extends into a bed 27 x 73 in. Folds into a package 3x7x38 in.

**Write
for Catalog
No. 5**

ENTERPRISE BED CO., Hammond, Ind.

Branches:—Chicago, Ill., Davenport, Iowa

(Continued from page 115)

the tractors, even though they were working at a disadvantage on account of the weather. Also, this man is an expert and has reduced the cost to a minimum. The average man probably could not put such soil under cultivation by the use of horses at as low a cost as \$6 per acre.

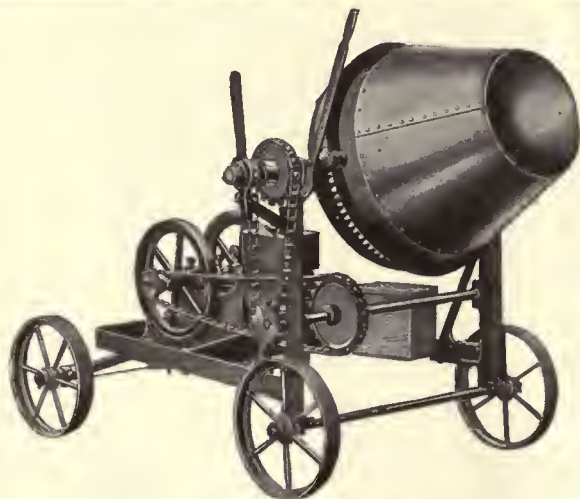
The soil plowed was planted to beans and the worth of the tractor for deep tilling was proved by the growth of the crop. The saddest part of our story is that the crop was destroyed by an exceptionally early frost. Up to that time, however, it was considered the largest crop of beans ever raised in Colorado.

One man, experienced in the raising of beans, inspected the crop after the pods were well filled and the beans had passed the soft stage. He stated that it would harvest 1,200 or 1,500 pounds to the acre. Perhaps the best crop in that soil raised by ordinary methods of cultivation would average about 800 pounds to the acre.

This experiment shows what deep tillage will do and the value of it. It also shows the necessity of using traction power for hauling deep-tilling machines if the best results are to be obtained.

We Duplicate all Infertile Eggs. White and Columbian Wyandottes, Single Comb White Leghorns, and Light Brahmas. We use trap nests. In business for 30 years. Brahma eggs, \$3 for 15; \$5 for 30. The other varieties \$2 for 15; \$5 for 50, \$10 for 100. Address

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Order from B. C. BUFFUM, Worland, Wyo.

(Continued from page 121)

moisture there is already in the soil.

After grain is cut, the ground is exposed to the direct rays of the sun. This dries the surface, draws out what moisture there may be in the subsoil and leaves the ground hard and dry.

Discing puts the ground in condition for the rapid absorption when rain falls or the snow melts, thereby preventing washing of the soil.

An intelligent and systematic use of the disc harrow year after year will greatly increase crop yields. This statement has been verified time after time by the most careful experiments.

There are great possibilities in the disc harrow trade; your advocating additional uses that will result in profit to the farmers is what will increase your disc harrow business.

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Made of specially selected upper leather and well seasoned soles. Durable, tough, pliable. Treated by special process to keep out water and moisture. For dress-up occasion wear Mayer Honorbilt fine shoes.

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The *Irrigation Age* has established a book department for the benefit of its readers. Any of the following named books on Irrigation and Drainage will be forwarded, postpaid, on receipt of price:

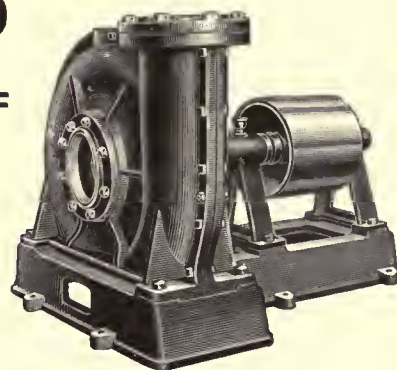
Irrigation Institutions, Elwood Mead.....	\$1.25
Irrigation Engineering, Herbert M. Wilson.....	4.00
The Primer of Irrigation, Anderson.....	2.00
Irrigation and Drainage, F. H. King.....	1.50
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For this large
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Other sizes in
proportion.



Without
comparison the biggest
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“BUFFALO” CLASS M SIDE- SUCTION CENTRIFUGAL

For general drainage and irrigation purposes not exceeding 50 feet total head the Buffalo Class M Centrifugal Pumps represent the highest manufacturing achievement in producing, at a popular price, a pump of astonishing quality—low power consumption, smooth operation, extraordinary strength and freedom from repairs.

The large pulley is supported on either side by extra long bearings furnished with brass grease cups. The bearings are lined with genuine white babbitt metal only. To insure operation without attention, a very long packing gland is provided on the shaft. Companion flanges, both for suction and discharge opening, are furnished without extra charge. All parts of these pumps, being accurately made, are interchangeable and can be promptly duplicated at any time.

Our class M pumps are also furnished in vertical suction type and for submerged service. Ask for our catalog. Tight and loose pulleys, foot valves, flap valves, primers and other accessories can be furnished at a small extra cost.

The prices are f. o. b. works for iron pumps. Brass or brass fitted pumps also furnished.

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BUFFALO STEAM PUMP CO.
BUFFALO, N. Y.

Agents Wanted for our complete line of pumps for every purpose.

NATION AND STATE JOIN FORCES.

Cooperation between United States Geological Survey and State of California in Topographic Mapping and Investigation of Water Resources.

One of the strongest evidences of the practical value of the work of the United States Geological Survey is furnished by the fact that many of the states have appropriated money with which to assist in its investigations, under co-operative agreement. The people of the states are desirous of securing the results of the Geological

Survey's work at a faster rate than they can be furnished with the appropriations provided therefor by Congress. Instead of using the funds to carry on independent investigations of the same kind, the states apparently realize that it will be better for them to make use of the equipment and qualified corps that the Geological Survey has accumulated and established for such work. In every state in which co-operation has been maintained the saving in expenditure and the results accomplished have been so great that the desirability and practicability of the arrangement have been proved beyond question.

Among the states which have in largest degree availed themselves of these co-operative opportunities is California. Under a general act the state has made a continuing appropriation, which provides \$15,000 annually for topographic mapping and \$9,000 annually for the investigation of stream flow and underground water resources. This work is carried on in connection with the regular Geological Survey work under co-operative agreement between the survey and the state engineer.

ADDITIONAL CONTRIBUTIONS BY CALIFORNIA

The California Conservation Commission, authorized by an act of the legislature to make an investigation of the natural resources of the state, found that it required information concerning the water resources at the earliest possible date and therefore entered into an agreement with the Geological Survey, by which the survey undertook special investigations of stream flow and water power under an allotment of \$12,500.

The State Board of Control (Water Powers), authorized by an act of the legislature to make a special study of the available water powers of the state and to recommend legislation for their control, likewise entered into a co-operative agreement with the Geological Survey to compile a complete digest of all available data concerning the flow of streams in the state of California and made an allotment for that investigation of \$4,000.

INVENTORY OF WATER RESOURCES

The results of the work thus undertaken are being published by the Geological Survey in six volumes designed Water-Supply Papers 295 to 300, inclusive. Nos. 295, 296,



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Sand on either outside or in cannot injure them. Will raise and force water, sand and gravel any distance required.

Saves fifty per cent of fuel.

Most economical irrigating and drainage pump to both install and operate now on the market. Will work submerged if required.

Has given 16 years of satisfaction to the largest concerns in America.

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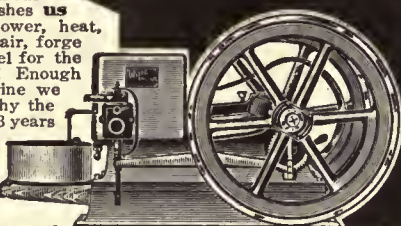
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Profit By Our Good Luck!

Share with us this immense saving and get a well tested engine—one with detached cylinder and valves, and all the improvements known to the trade today—an engine built by one firm for the past 43 years with a **REAL 5-YEAR GUARANTEE**. They run on any grade of fuel and are made in 64 styles and sizes. Write for **Free Trial Offer and Catalog**, stating size wanted.

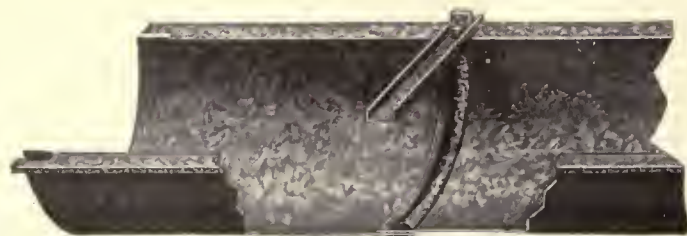
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Made entirely of rust-proof, galvanized iron. No bolts or rivets used in construction. This flume is



Section of Flume

considered by experts to be the most serviceable equipment for the purpose on the market. A careful examination of the construction as shown herewith will convince those who are acquainted with irrigation conditions of its lasting quality and the ease with which it may be put together. Complete information, with prices, will be furnished on application to the

KLAUER MFG. COMPANY, Dubuque, Iowa

and 297 are hydrographic gazetteers containing information concerning all streams, lakes, ponds, and other bodies of water within the state. Nos. 298, 299 and 300 contain the results of all stream-flow measurements that have been made within the state.

The State Board of Control (Water Powers), finding itself in need of accurate information concerning the fall of the principal rivers of the state, made a further allotment to the Geological Survey for special profile surveys of the Pit, Middle Fork of Feather, three forks of the American, the Tuolumne, and the San Joaquin rivers, allotting therefor the sum of \$10,600.

The California State Water Commission, which succeeded the Board of Control (Water Powers), has recently entered into an agreement for the further pursuit of stream flow investigations under an allotment of \$3,500.

INVOLVES VALUES OF MILLIONS OF DOLLARS

All this work above described, together with that which has been carried on in previous years under co-operative agreement between the survey and the state engineer, will make available to the people of California practically complete information concerning the water resources of the state, the actual value of which has already been demonstrated to be many millions of dollars and the future value of which will overrun all estimates that may at the present time be considered reasonable.

GLACIER DIVERTED COLUMBIA RIVER LONG YEARS AGO.

Moses Lake Survey Sheet of United States Geological Survey Reveals Secrets of Pre-historic Period.

When the great plains which rise high above the Columbia River canyon in eastern Oregon are entirely mapped, showing all the elevations, it will be plainly seen how the waters of the Columbia were in pre-historic time diverted from its canyon and were made to traverse a new course. A recently issued topographic map covering a portion of this Columbia river plain is the Moses Lake sheet, in Grant county.

In the field season of 1910 Robert Muldrow and C. F. Eberly, topo-

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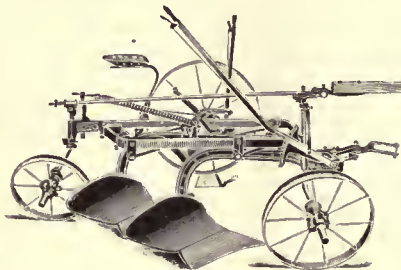
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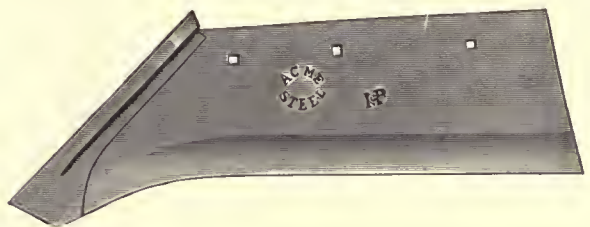
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graphic engineers of the United States geological survey, made a detailed survey of the area known as the Moses Lake quadrangle. The work was done in co-operation between the state of Washington and the federal geological survey, each paying half the cost. The Moses Lake map covers an area of 203 square miles and is published on a scale of approximately one mile to the inch, with a contour interval of 25 feet.

Moses lake is shown in the central portion of the map as a long, irregular sheet of water resembling one antler of an elk. This hornlike form is recognized in the local names, Pelican Horn, Parker Horn and Lewis Horn, which have been given to spurs of the main lake.

PRESENT LAKE PART OF OLD CHANNEL.

Moses lake is believed to have been at one time part of an old channel of the Columbia river. Dur-

ing the glacial period, recent as time is measured by the geologist, but long before the beginning of human history, the valleys of the northern Cascades and of the Okanogan highlands were filled with enormous glaciers, the largest of which reached the plains before they were melted in the warmer air of the lower country. The greatest of these ice rivers of eastern Washington flowed down the Okanogan valley, which it filled to the depth of hundreds of feet.

On reaching the Columbia river valley this glacier expanded and seems not only to have dammed the Columbia, but to have filled its great canyon for some distance. The southern limit of this great Okanogan glacier is marked by a terminal moraine many miles in width. The moraine is formed of dirt and rock material which was pushed along in front of the advancing glacier or carried on its surface and stranded where the ice melted, and it includes many huge blocks of basalt and other rock. One enormous piece of basalt, known as Pilot Rock, which was probably carried by the glacier for some distance, is a striking landmark that can be seen for many miles.

THROUGH GRAND COULEE.

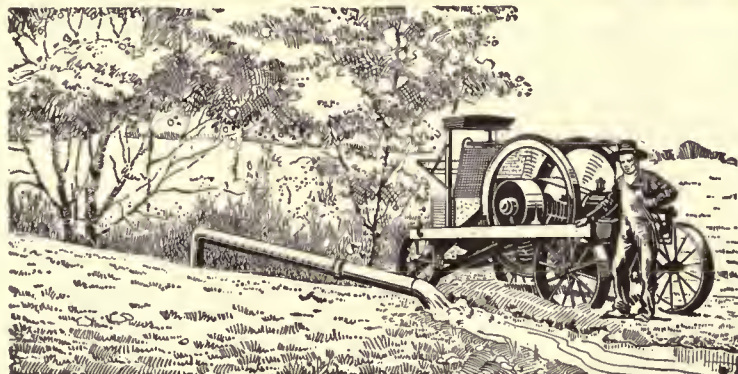
North of the Moses lake quadrangle is a broad canyon known as the Grand Coulee, which is in reality an old cut-off of the Columbia river. When the Okanogan glacier dammed the Columbia, the waters of that river escaped southward by way of Grand Coulee. Moses lake and other nearby lakes are today remnants of the old channel. For a portion of the time that the great river flowed through the coulees it plunged into the lower canyon over a precipice some 400 feet high.

No more impressive scene can be found in the Big Bend country than is presented by the great cliffs of black basalt below Coulee City, over which the Columbia once poured, but where now desert shrubs are growing silently in the ancient channel. Crab Creek valley, which was a portion of the old channel, is plainly an ancient abandoned stream course, sunken in the basalt.

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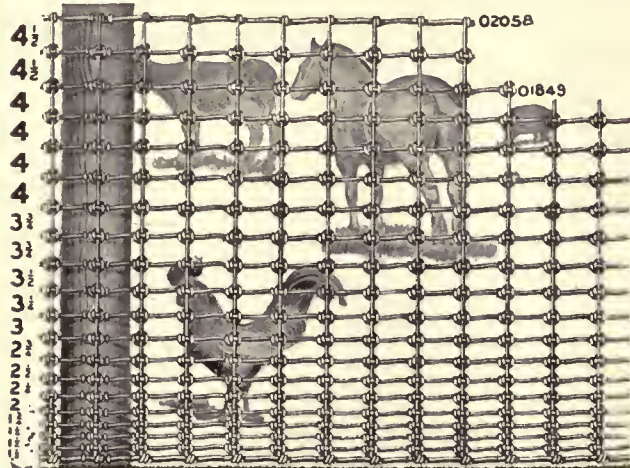
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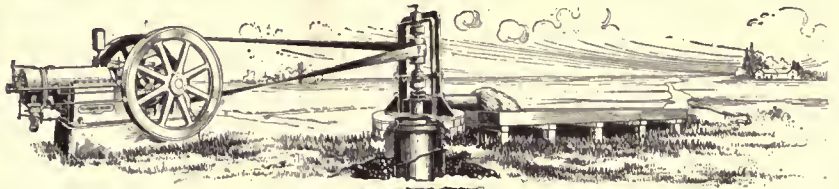
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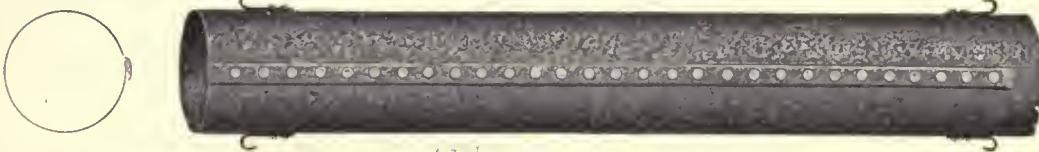
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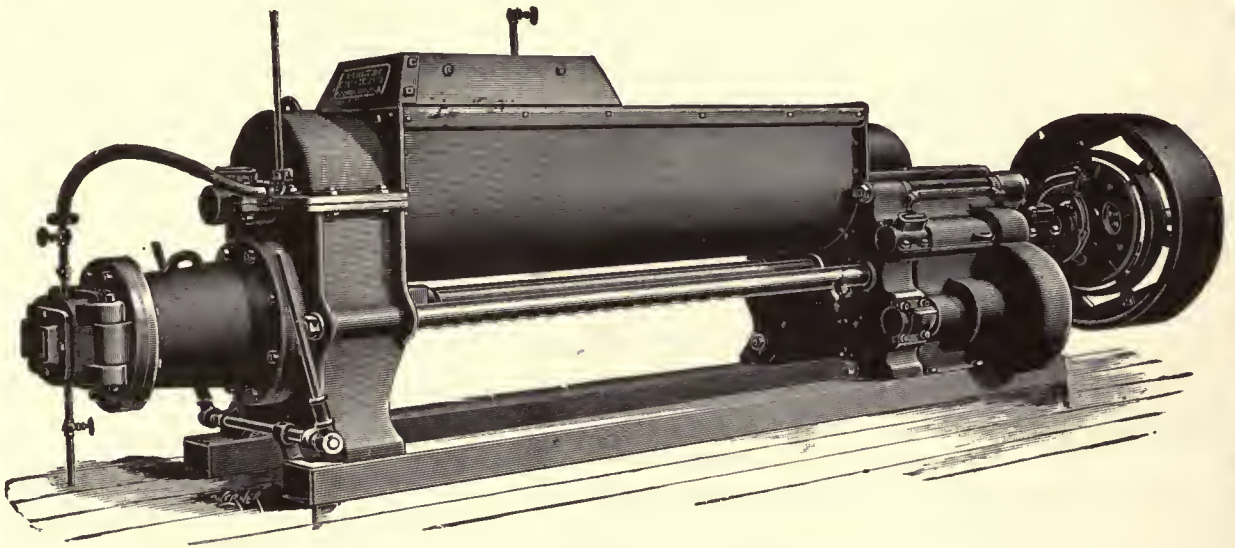
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A. M. CLELAND, General Passenger Agent
ST. PAUL, MINN.



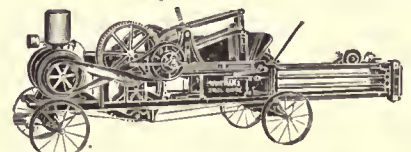
Whitman's Sultan Engine Means \$\$\$\$

to the man that operates a Hay Press.

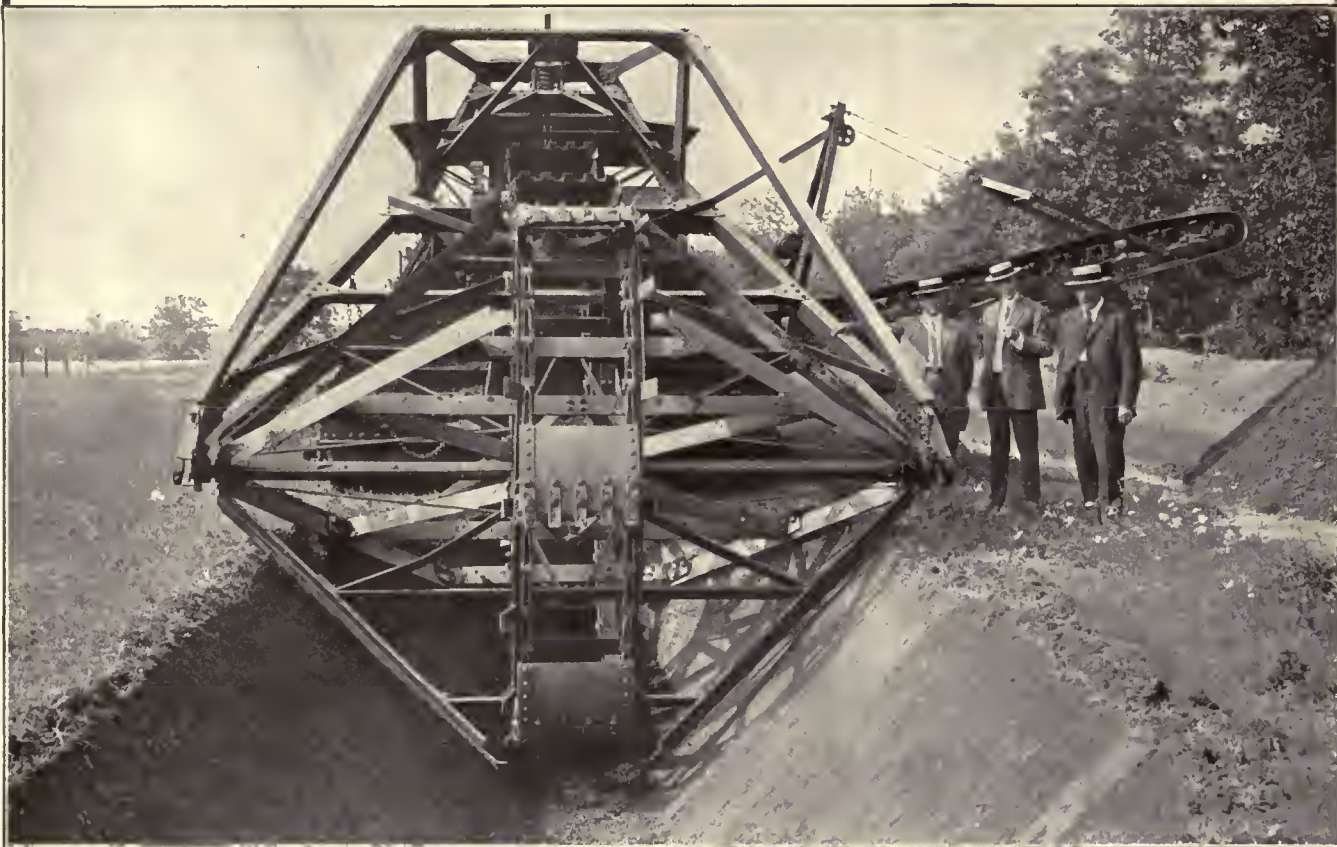
Less expense in upkeep. Cheaper Repair Bills; Less Breakage. When you buy a WHITMAN Steel Queen Hay Press or Alfalfa Baler you get an engine on your press that is built by the same factory that builds the press. Every experienced hay baler knows the quality of Whitman's World's Standard Baling Presses and knows when he buys a WHITMAN Press he has that guarantee for life that has made WHITMAN machines so famous in every country in the world.

Write for Hay Press Catalogue and Gasoline Engine Catalogue and secure best at start.

Whitman Agricultural Co.
St. Louis, Missouri, U. S. A.



Open Tile Outlets Are Vital to Successful Drainage



Choking Up of Tile Outlets Into Open Ditches is a common trouble in land drainage and is due to three main causes.

Capstan or Plow Ditches cannot be dug deep enough to give the ditch bottom the requisite drop below the outlet.

Caving Banks Due to Vertical Sides and close spoil banks wreck and bury the outlets.

Formation of Silt Bars on the Bottom of the ditch close the outlets unless repeatedly removed by hand excavation.

These Causes of Trouble Are Eliminated by constructing open ditches with an **AUSTIN DITCHING MACHINE** with Bank-Sloping Attachment.

The Austin Ditcher cuts a ditch whose depth is 2 to 3 feet below the deepest ordinary tile outlet. It slopes the banks of ditch to the exact angle required and throws the spoil well away from the ditch edge. It carves a ditch from the natural soil with smooth bottom and sides so that there is no loose material to wash and no irregularities to start silt bars. It can be converted by a simple alteration so as to dig a tile ditch with vertical sides or a sewer trench. It will excavate open ditch or tile ditch at a maximum speed of 9 feet per minute, depending upon the size of the ditch and the character of the soil.

Send for Catalogue No. 200

F. C. Austin Drainage Excavator Co.

(25 years practical experience building excavating machinery)

Agents Wanted in Open Territory

RAILWAY EXCHANGE, CHICAGO

New Things Wanted

By R. E. Olds, Designer

Here are some new things every man wants when he comes to select a new car.

Cars without them will soon be distinctly out of date.

Center Control Left Side Drive

Note the costliest cars for 1913. Note that the driver sits on the left side, close to the cars he passes. Note that the levers are all in the center, to be operated with the right hand.

What the finest cars use this year will next year become universal.

Reo the Fifth has both these features. But our center control is a single light lever. All the gear-shifting is done by moving this handle only three inches in each of four directions. It's as simple as moving the spark lever.

Both breaks are operated by foot pedals. So there are no side levers. Both front doors are clear.

Right side drive and side levers are now both out of fashion.

Oversize Tires

Skimping on tire size is also old-fashioned. It multiplies tire upkeep.

Reo the Fifth uses tires 34x4. Tires often used on cars of this size would cost us \$60 less. But that \$60 saves you hundreds of dollars during the life of the car.

Timken Bearings

Timken roller bearings cost five times what common ball bearings cost. But they do not break.

But when makers say "Timken bearings" ask them just how many. Some use only two.

Reo the Fifth has 15 roller bearings—11 Timken, 4 Hyatt High Duty.

And, to guard against flaws, we use 190 drop forgings. Steel castings, which have frequent flaws, cost but half as much.

Look for Safety

In the costliest cars all vital parts are built with large margins of safety. Don't buy any car without them.

We give our parts at least .50 per cent over-capacity.

To make sure of this we twice analyze every lot of steel. We test our gears to stand 75,000 pounds per tooth. We test our springs for 100,000 vibrations.

Men who know, in these days, take no chances in their cars.

Other Needs

Get a magneto on which you can start. We use a \$75 magneto.

Insist on a doubly-heated carburetor. One needs it in these days of low-grade gasoline.

Insist on a 17-coated body, else the finish will not last.

Insist on flush electric dash lights. Side lamps are out of style.

Get upholstery of genuine leather filled with the best curled hair.

A car of this size should have 14-inch break drums. It requires wide, seven-leaf springs.

Cars at close prices are rarely built like this. Hidden parts are very often skimped. New things are omitted because of the cost.

But buyers of new cars should see that they get them. Your delight in a car depends on it. So do safety and comfort and low cost of upkeep.

When buyers refuse to take anything less, all cars will be built like this.

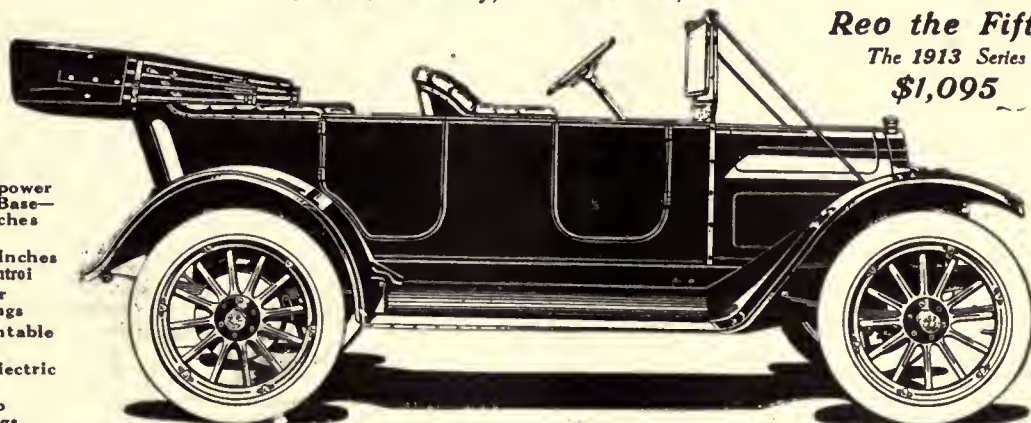
Please look into this car—the final result of my 26 years spent in car building.

Write for our catalog, and name the nearest dealer.

R. M. OWEN & CO. General Sales Agents for **REO MOTOR CAR CO., Lansing, Mich.**
Canadian Factory, St. Catharines, Ont.

Reo the Fifth
The 1913 Series
\$1,095

30-35
Horsepower
Wheel-Base—
112 inches
Tires—
34x4 inches
Center Control
15 Roller
Bearings
Demountable
Rims
Three electric
lights
190 Drop
Forgings
Made with
2 and 5
Passenger
Bodies



Top and windshield not included in price. We equip this car with mohair top, side curtains and slip cover. windshield, gas tank for headlights, speedometer, self-starter, extra rim and brackets—all for \$100 extra (list price \$170).



THE HOME MAKER

Get Your Canadian Home from the Canadian Pacific



WE WILL make you a long-time loan—you will have 20 years to pay for the land and repay the loan—you can move on the land at once—and your Canadian farm will *make you independent*.

This offer is directed only to farmers or to men who will actually occupy or improve the land.

Why not go where you can own 10 acres for every acre you own or farm here; where *every* acre will produce *double* what a worn-out acre produces anywhere?

Not on the face of Mother Earth can you find better land than this rich virgin Canadian soil. The enormous crop yield per acre *proves* this every season.

We Give You 20 Years to Pay

We will sell you rich Canadian land for from \$11 to \$30 per acre. You need pay only *one-twentieth* down. Think of it—only *one-twentieth* down, and then twenty years to pay the balance. Long before your final payment comes due your farm will have paid for itself over and over again. Many good farmers in Western Canada have paid for their farms with one crop.

Here are some of the startling features of the most remarkable land offer you have ever read:

We Lend You \$2,000 for Farm Improvements

An offer of a \$2,000 loan for farm development, with no other security than the land itself, *guarantees our confidence* in the fertility of the soil and in your ability to make it produce prosperity for you and traffic for our lines.

The \$2,000 loan will help you in erecting your buildings and making things easier the first few years, and you are given 20 years in which to fully repay this loan. While enjoying the use of this money you pay only the banking interest of 6 per cent.

Advance of Live Stock on Loan Basis

•The Company, in the case of the approved land purchaser who is in a position and has the knowledge to take care of his stock, will advance cattle, sheep and hogs up to the value of \$1,000 on a loan basis, so as to enable the settler to get started from the first on the right basis of mixed farming.

If you do not want to wait until you can complete your own buildings, dig your well and cultivate and fence your farm—if you want this work all done for you before you start for Canada—select one of our Ready-Made Farms—with home and buildings complete, land cultivated and in crop, *ready for you* and pay for it in 20 years.

We give *free* service—expert advice—the valuable assistance of great demonstration farms, in charge of agricultural specialists employed by the Canadian Pacific for its own farms. This service is *yours—free*.

This Great Offer is Based on Good Land

The Canadian Pacific offers you the finest land on earth for grain growing, cattle, hog, sheep and horse raising, dairying, poultry, vegetables and general mixed farming—irrigated lands for intensive farming—non-irrigated lands with ample rainfall for mixed and grain farming. Remember, these lands are located on or near established lines of railway, near established towns.

Your new home and your fortune are ready for you in the famous, fertile Canadian West, with its magnificent soil, good climate, churches, public schools, good markets, good hotels, unexcelled transportation—and 20 years in which to pay for your farm and repay the improvement loan.

Here is the Last Best West—where *your* opportunity lies. Don't delay. Mail the coupon here at once. The best land will be taken first—so time is precious to you. *Write today.*

K. J. THORNTON

Colonization Commissioner

Canadian Pacific Railway Colonization Department

112 West Adams St., Chicago, Ill.

For Sale—Town lots in all growing towns.
Ask for information concerning Industrial
and Business openings in all towns.



☐ Book on Manitoba ☐ Book on Saskatchewan ☐ Book on Alberta

(Make a cross in the square opposite the book wanted).

K. J. Thornton, Colonization Commissioner,
Canadian Pacific Railway, Colonization Dept.
112 West Adams Street, Chicago, Ill.

Please send me the books indicated above.

Name.....

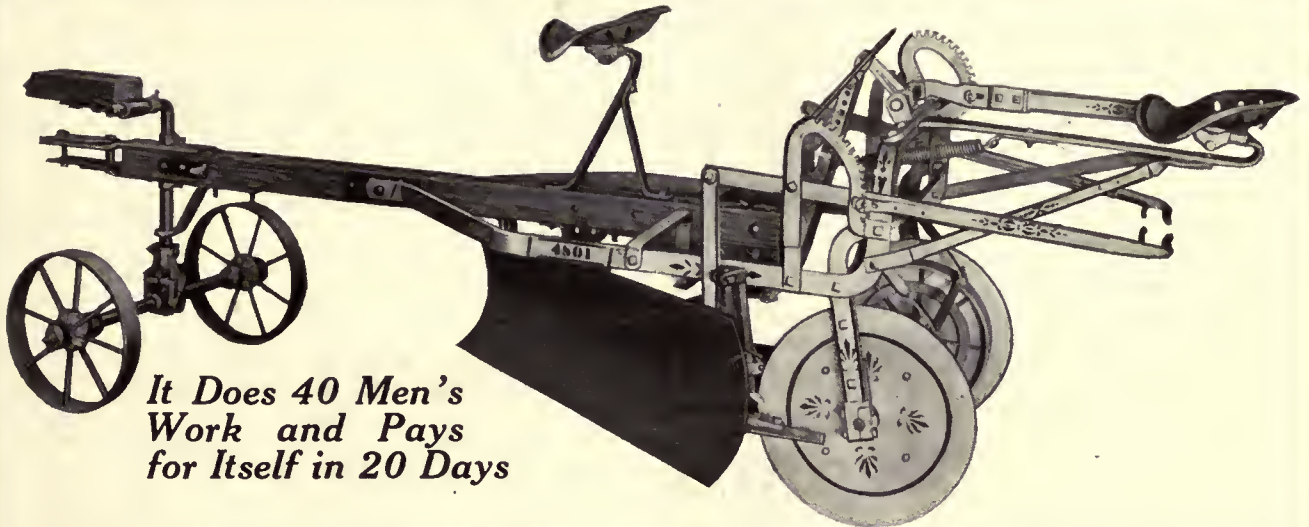
Address.....

Town..... State.....

THE 20th CENTURY GRADER

Builds Irrigation Ditches

AT LOW COST!



*It Does 40 Men's
Work and Pays
for Itself in 20 Days*

WITH ONE MAN AND A TEAM OF HORSES, IT BUILDS DITCH 4 FT. WIDE, 26 IN. DEEP, AND A MILE LONG, IN ONE DAY AT A COST OF ONLY 2 CTS. PER ROD



Does *more* and *better* work than most two men, four horse graders and will do work that no other grader *can* do. It builds a fine, clean, hardsided ditch that *positively* gets a good-sized flow of water *on the land*, turning dry, arid land into blooming, profit-bearing acres.


The 20th Century is Light, Yet Wonderfully Strong

Built of reinforced steel throughout and *near the ground*, where it gets *all* the dirt. Has patented, exclusive features, which make it the *best* machine on the market for this work. Has direct pull on the load—no waste power. Saves time, horses, money and labor.

It never "loafs" or "gets tired" and is a profit-producer *all the time*, because it can be put to a great variety of other farm uses, such as

Making Roads, Building Drainage Ditches, Leveling Land, Cutting Underbrush, Etc.

You ought to have one of these graders on your farm *NOW*. It will be worth its weight in gold to you.

Mail Us This Coupon 

And we will send you a handsome catalog giving full particulars and many valuable pointers on how to increase farm profits.

Do It NOW

The BAKER MANFG. CO.

526 Hunter Bldg. - - CHICAGO, ILL.

Tear out, sign and mail

Date.....

THE BAKER MFG. CO., 526 Hunter Bldg., Chicago, Ill.

Please send me catalog.

I own acres of land; I own acres of bottom land.

Name.....

Address.....

HARVEY B. CHESSE, JR.
President

WILLIAM C. CHARLTON
Sec'y and Treas.

C. STOWE RENO
Gen'l Sales Mgr.

The
**Consolidated Expanded
Metal Companies**
INCORPORATED

MANUFACTURERS OF

Expanded Metal
AND
"Xpantrus" Bar
For Concrete Reenforcement

**Steel Lath, Light Steel Chan-
nels, Special Sheared Plate**

Address All Communications to the Companies, BRADDOCK, PA.

Office General Sales Manager
Centurian Building, New York City

General Offices and Works; Rankin, Pa.

**Chicago Office:
904 Westminster Building**

All Contracts and Agreements Subject
to Strikes, Accidents or Causes Beyond
the Company's Control—All Quotations
for Immediate Acceptance.

JOHN P. WAGNER
Sec'y and Treas.

Hollow Core Wall for Hydraulic Fill Dams

In a Hydraulic Fill dam the problem of the drainage of the sluicing water is of controlling importance. The sluiced material should be such that it will not retain the sluicing water for an undue time. If the material is such that it will not deliver the water with reasonable rapidity a decided settlement with consequent cracks is bound to ensue when the fill ultimately dries out.

The sluicing water on the fill is maintained in a summit pool by hand-made levees. It is found that in depths downwards to 5', the material in suspension becomes comparatively solidified and it will then hold its shape and consistency. The sluicing water, however, must necessarily be under constant drainage if rapid construction and solid banks are expected.

A Hydraulic Fill dam during construction generally has water in the impounding reservoir above it which rises at substantially the same rate as the increasing height of the dam, but a little below its level, thereby reducing the drainage head in that direction. Assuming that there is no core wall, the sluicing water is forced to pass largely through the down stream fill unless drainage tubes in some form are provided. The passage of the drainage water through such a mass of material is slow, and hence full advantage cannot be taken of the otherwise rapid method of hydraulic construction.

Again, the material of the fill will not take its final set until the fill is complete. The fill is therefore saturated during construction, and saturated material is always of greater bulk than dry material. This fact accounts in a measure for the excessive settlement in hydraulic fills.

All this is controlled by building a Hollow Core Wall through the center of the embankment, and providing it with numerous drainage gates of simple construction. A facing of broken stone or gravel should be placed next to the upstream face of the core wall.

It is evident at a glance that with this construction we have accomplished two things:

First, we have provided an effectual water-barrier whereby when the lower prism of the dam is once drained it is forever protected against re-saturation.

Second, the problem of drainage is entirely under control and can be hastened or retarded at will. Drainage head is secured in two directions, namely, towards the core and towards the toe. The material more quickly receives its final set and unexpected settlement is thereby avoided. The time of construction is greatly hastened.

Moreover, in the usual form of construction the levees on the outside edge of the pond frequently give way and permit a localized washout on the slope of the fill. The central drainage into the Hollow Core Wall permits of instant relief of excessive water and makes a washout impossible.

Again, if the sluicing material is such that it settles rapidly, the surface water can be quickly drawn off into the Core Wall.

Once the fill is completed the drainage gates into the Core Wall from the lower prism are permanently opened. This insures an absolutely dry prism; a result never before reached.

The above is a mere outline of the functions of the Hollow Core Wall in relation particularly to the Hydraulic Fill during construction. The advantages named in a previous advertisement in connection with an ordinary rolled earth dam apply in full to the Hydraulic Fill when the same is completed and in permanent service.

The above notes are fairly illustrated by the sectional drawing herewith presented which roughly represents a Hydraulic Fill Dam in process of construction. The Hollow Core Wall is carried up to and a little above the ultimate embankment and provides interior inspection through the heart of the fill.

This topic is more fully treated in our Circular on EARTH DAMS. The introduction of the Hollow Core Wall entirely changes the basic problem of an earth dam, whether of rolled earth or hydraulicked into place. These points will not admit of discussion in an advertisement.

Respectfully submitted,

AMBURSEN HYDRAULIC CONSTRUCTION CO.
ENGINEER-CONSTRUCTORS, 88 Pearl St., Boston, Mass.

All inquiries from Canada should be addressed to
Ambursen Hydraulic Construction Co.,
405 Dorchester St., West, Montreal, P. Q.



HYDRAULIC FILL DAM WITH HOLLOW CORE WALL IN PROCESS OF CONSTRUCTION

SPECIAL NOTICE

We take pleasure in announcing that we have perfected an arrangement whereby Messrs. Lewis & Wiley of Seattle, Washington, become associated with us in all work involving the sluicing of earth for the construction of dams or for any other purpose. The reputation of the above concern was made in the famous re-grade of Seattle, whereby the hills of that city were cut down and used for fill on the water front. A similar contract has been carried out by this company in Portland, Oregon, and a third one is now in progress in Seattle.

Messrs. Lewis & Wiley are undoubtedly the foremost concern in the world in this special line of work, and we deem ourselves fortunate in securing their association with us.

AMBURSEN HYDRAULIC CONSTRUCTION CO.

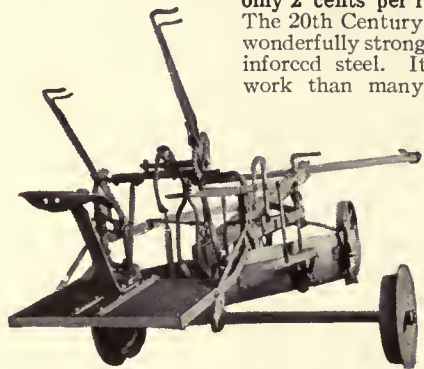
IRRIGATION DITCHES BUILT AT LOW COST!

Turn that dry, arid, worthless land of yours into crop and profit bearing acres by a few well placed irrigation ditches. With one man, a team of horses and a

20th Century Grader

You can, in one day, dig a clean, hard-sided ditch—a mile long, 4 feet wide and 26 inches deep, that will absolutely get the water on the land! And it will cost only 2 cents per rod to do it.

The 20th Century is light, yet wonderfully strong; built of reinforced steel. It does more work than many 4-horse, 2-men graders, because it has direct pull on the load, and there is no waste power. It saves time, saves money, saves labor, saves horses.



In Fact It Does 40 Men's Work and Pays for Itself in 20 Days,

Has many new exclusive features not to be found on other graders and it is low in cost.



Showing the 20th Century digging an irrigation ditch. 4-ft. side and 26-in. deep. Note clean, hard sides, allowing strong flow of water.

The 20th Century is also unexcelled for Making Roads, Leveling Land, Cutting Sagebrush and a hundred other farm uses. Thousands now giving satisfactory service. Drop us a postal now for our

FREE CATALOG.

It fully describes and illustrates the 20th Century and contains many interesting and valuable pointers on how to increase profits. Write for it NOW!

The Baker Mfg. Co.

526 Hunter Bldg., Chicago, Ill.

We allow easy payments to responsible parties.



This splendid 70 gallon vertical suction, centrifugal Buffalo Pump for only

\$28.50

Larger Sizes in Proportion

"Buffalo" Vertical Suction Centrifugal Pump—the highest pump value ever offered at the price

We are prepared to make stock shipments from factory of this highly recommended and exceedingly popular irrigation pump, used for heads not exceeding over 50 feet. It belongs to the trade-marked "Buffalo" Class M family, which has won just recognition as the highest value obtainable in popular priced centrifugal pumps. The outfit includes pump, pulley, companion flanges and coupling for both suction and discharge, as shown. Only the finest white babbitt metal is used in the extra long bearings, which are furnished with brass compression grease cups. Thrust bearing is of ball bearing type. It may be installed by attaching the suction flange directly to the well casing, the pump itself being set between two vertical timbers, which also carry the shafting, bearings, etc., and is driven by pulley located above the ground at top of the well. Bearings, shaft collars, and steel shafting can be supplied at a slight extra cost to suit your individual requirements. Being accurately made and fitted, all parts of the pump are interchangeable and can be promptly duplicated at any time. Couplings are bored same size as shaft and bearings. Larger sizes also made. The price quoted is f. o. b. our factory.

Send us your order now.

Ask for Catalog No. 237-C.

BUFFALO STEAM PUMP CO.

Buffalo, N. Y.

Agents Wanted for our complete line of pumps for every purpose

The Rural Road Grader For Irrigation Work

The blade of the Rural has the proper adjustment for making V Bottom Irrigation Ditches on a slope of one and one-half to one. Any elevation can be given the blade that the banks will stand. Rear end of blade raises 24 inches. Changing single-tree holes in the eveners, which places the rear horse in the ditch, is the only change needed in the Rural to adapt it to V bottom ditch work. The wheels being wide apart, which best holds a grader to its work, and lets one wheel travel in the point of the ditch and the other completely outside of the bank of earth thrown up, leaving the slope smooth and undisturbed.

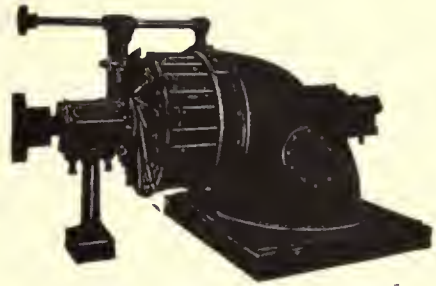


Making a V Bottom Irrigation Ditch Two Feet Deep on a Slope of One and One-Half to One. Two or Four Horses are Used, According to Requirements.

The Rural Grader is not tipped to any extent, owing to the wheels being wide apart and the axle having been made lower on the right hand side to equalize up on ditch work. In a grader with the wheels close together, one, and perhaps both, of the wheels must travel on the slope of the ditch, destroying the bank and tipping both machine and operator to a dangerous angle. Unequaled for cleaning out all deposits of silt, grass, etc., from irrigation ditches, whether dry or under water, anywhere teams can be made to travel. For the Irrigation Farmer, the Rural Grader and Ditcher is not equalled by any other machine if he wants one for business and the greatest value for his money. Any One with considerable level land can use one with much profit for opening up ditches through fields, which it will do, even when the lands are under water. To make larger and more permanent ditches and also to build and repair roads that the farmer is interested in.

C. D. EDWARDS, Albert Lea, Minn.

SAMSON TURBINE



When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

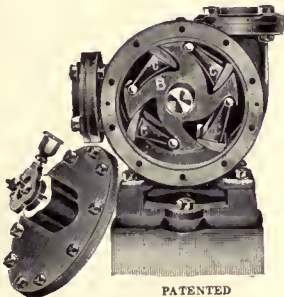
JAMES LEFFEL & CO.

Springfield, Ohio, U. S. A.

316 Lagonda Street

Blackmar Rotary Pump

(Interior View)



PATENTED

*Large Capacity with
Minimum of Power*

One customer writes he pumped 21,000 gallons with a fuel consumption of 1 gallon of gasoline.

Runs quiet; is high in efficiency and durability. Wear automatically taken up. Few parts, no springs, no adjustments. Requires little or no attention.

One customer has 500 in use.

Capacity, 5 to 500 gallons per min.

Tell us about your pumping problems.

**Blackmar Pump Power
& Manufacturing Co.**

PETOSKEY, MICH., U. S. A.

**BANKERS, BROKERS, FINANCIERS
OR IRRIGATION PROMOTERS**

A Wonderful Opportunity

I am interested in the ownership of a 40,000 acre irrigation project in northeast Moffat County, Colo., "The Coming Empire of the West." Land under project will be taken up as homesteads or desert claims. The Moffat roads extension to Salt Lake City, which is now being built very near this project, will settle this land very quickly.

We now have enough applications for water rights from reliable settlers, now living under this proposed project, to insure its success.

It possesses such natural advantages that all construction work can be done for \$175,000 and with water rights selling for \$25 per acre this deal will pay 500% profit.

One of Colorado's foremost engineers says this to be the best project of its kind in the Rocky Mountain region.

We want some good reliable parties to take hold of this proposition and finance it, or, we will sell our holdings outright.

A SPLENDID MONEY MAKING CHANCE FOR YOU

Full details and reports gladly furnished.

L. B. MAUPIN, BAGGS, WYO.

Cashier First State Bank

MAKE MONEY MAKING CEMENT TILE

The field is unlimited and uncrowded; marketing the product in competition with the clay interests and at clay tile prices produces a great profit and a glance at the future spells only success for the factory or business started today.

No existing proposition offers such flattering inducements or such a field of opportunity for the man looking for a vocation or for the man looking for an investment. No other business can net you such profits on the amount of capital involved, and no other business has such an unlimited future.

Just think of a business paying from 30% to 50% on the investment the very first season, and subsequently from 50% to 150%, then ask yourself the question—Is it worthy of investigation?

Our literature gives you all the details regarding the merits of cement tile, the cost of manufacture, the amount of capital required to embark in the business; how to build your factory and last, but not least, it tells you how we aid the manufacturer using our machinery and gives you our full and complete proposition. A short letter telling that you are interested will bring complete data.

The Cement Tile Machinery CO.

172 Rath St., Waterloo, Iowa.



SUPERIOR
THE NAME TELLS A TRUE STORY

No matter where you live or what your seeding conditions are, you can get a **SUPERIOR GRAIN DRILL** that will fill the bill and do your work in the best possible manner. Superior Drills are made in all sizes and every style. Every Superior Drill is sold under a warranty that absolutely protects the buyer. Send for catalogue. Read it and go to your local dealer and insist on seeing the Superior Drill.

AMERICAN SEEDING MACHINE CO., (Inc.)
Springfield, Ohio

GRAIN DRILLS

This Cot
Weighs
Only
30 Pounds

Can Be Set
Up or
Folded in 30
Seconds

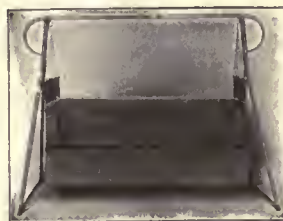


All Openings
Fitted With
Heavy Canvas
Storm
Curtains and
Mosquito
Netting

FOR OUT-DOOR SLEEPING

Designed for Campers, Fishers, Hunters, Miners, Prospectors, Ranchmen and Invalids

There is no more popular or useful article of porch or lawn furniture made than the **ENTERPRISE COUCH HAMMOCK**. It can be used as a couch, settee, hammock or an out-door bed and is so thoroughly well constructed that it is almost indestructible.



Enterprise Couch Hammocks



The "Kumpak" Cot

Ideal because of its simplicity. Extends into a bed 27 x 73 in. Folds into a package 3x7x38 in.

Write
for Catalog
No. 5

ENTERPRISE BED CO., Hammond, Ind.

Branches:—Chicago, Ill., Davenport, Iowa



It's Always Wet Underfoot
when you turn the water on, but you can get a long time-insurance against wet feet and an ill-fitting boot if you buy the boot with the Red Ball, the trade-mark of "Ball-Band" Quality.

Eight million men wear "Ball-Band" Rubber Footwear. No man ever buys "Ball-Band" Rubber Boots because they are cheap; they are not cheap boots. Yet they are not high-priced. When you consider the extra long wear of "Ball-Band" Boots—made strongest where boots generally give way first and reinforced at every point where the strain comes, you are bound to admit that they give immense value for your money. Figure their price on the cost per day's wear and they become very low priced.

Consistence as well as skill goes into the making of "Ball-Band" Boots—good work as well as good rubber. It is these things that have made the Red Ball the sure sign of rubber footwear you can trust.

There is a "Ball-Band" Store near your home. Go there and buy your boots. If your dealer hasn't them write us.

For every cent they cost you "Ball-Band" Boots will give you a full return of wear and satisfaction.

Write for Free Illustrated Booklet
Mishawaka Woolen Mfg. Co.
346 Water St., Mishawaka, Ind.

"The House that Pays Millions for Quality."

Twenty-Eighth Year

THE IRRIGATION AGE

VOL. XXVIII

CHICAGO, MARCH, 1913.

No. 5

THE IRRIGATION AGE

With which is Merged

The National Land and Irrigation Journal

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD
THE IRRIGATOR

D. H. ANDERSON
PUBLISHER,

30 No. Dearborn Street, CHICAGO
Old No. 112 Dearborn St.

Entered as second-class matter October 3, 1897, at the
Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

The "Primer of Hydraulics" is now ready; Price \$2.50.
If ordered in connection with subscription \$2.00.

SUBSCRIPTION PRICE

To United States Subscribers, Postage Paid, \$1.00
To Canada and Mexico, 1.50
All Other Foreign Countries, 1.50
In forwarding remittances please do not send checks on
local banks. Send either postoffice or express money order or
Chicago or New York draft.

Official organ Federation of Tree Growing Clubs of
America. D. H. Anderson, Secretary.

Official organ of the American Irrigation Federation.
Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the
only publication in the world having an actual paid in advance
circulation among individual irrigators and large irrigation corpo-
rations. It is read regularly by all interested in this subject and has
readers in all parts of the world. The Irrigation Age is 28 years
old and is the pioneer publication of its class in the world.

ANNOUNCEMENT

As intimated in our editorial columns in December and January, the publisher of the IRRIGATION AGE has purchased all the rights, copyright to the title, good will and advertising contracts of the National Land and Irrigation Journal, published by the National Irrigation Journal Publishing Company of Chicago.

The IRRIGATION AGE has also taken over the entire subscription list of this journal and this new list which is in our hands at present comprises something over five thousand names.

The subscription list of the National Land and Irrigation Journal will be merged with that of the IRRIGATION AGE, and the subscribers to the Journal will receive copies of the IRRIGATION AGE in lieu of the National Land and Irrigation Journal during the period for which their subscription has been paid.

In taking over this property the publisher of the IRRIGATION AGE has also taken over the list of The Irrigator, a journal formerly published at North Yakima, Washington, which was purchased by the National Irrigation Journal Publishing Company and merged with that publication a year or more ago. This merger, and the subsequent taking over of the property from the National Land and Irrigation Journal, places the IRRIGATION AGE in the unique position of being the only distinct irrigation and reclamation journal in the known world.

As may be easily understood, this has greatly strengthened our subscription list and we are in a position today to offer advertisers much better service than at any time in the history of this publication.

The editorial policy of the IRRIGATION AGE will not be affected in any way by this change, as the undersigned is in full control and is sole owner of the AGE and its various interests.

It may not be out of place to state here that the combination of the National Land and Irrigation Journal of Chicago and the Irrigator of North Yakima with the IRRIGATION AGE completes a list of eight publications which have been purchased and taken over, and whose circulation has been merged with that of the IRRIGATION AGE.

The list comprises the following papers, all of which were well known in their day

The National Land and Irrigation Journal,

The Irrigator,

Modern Irrigation,

The Irrigation Era,

Arid America,

The Drainage Journal,

Mid-West,

The Farm Herald.

D. H. ANDERSON, Publisher.

Third National Drainage Congress.

The call for the annual convention of the National Drainage Congress, which is to be held in St. Louis in April of this year, has been sent out, and calls attention again to the duty which the nation should perform.

American Engineers for Spain.

Twenty American engineers and expert construction men sailed not long ago from Galveston, Texas, for Barcelona, Spain, to begin contracts for power plants and irrigation projects approximating \$40,000,000 in value. The principal part of the work will be in northeastern Spain, where thousands of arid acres will be irrigated.

February Number Attracts Attention

The February issue of the IRRIGATION AGE was one of the best numbers yet put out and has brought from our friends many kind words and letters concerning its appearance and the fact that we have taken over our only remaining competitor. This is all very gratifying and we are writing this to thank the many friends who have written to us.

Halt on Development Representing Millions.

Litigation which would call a halt on development representing millions of dollars may result from action taken recently by the Yakima Reclamation Water Users' Association. Resolutions were adopted protesting against the plan to irrigate the reservation suggested by the Reclamation Service or Secretary of the Interior, involving the expenditure of \$6,000,000.

India Engineer Desires Information

THE IRRIGATION AGE received a letter recently from Syed Barhanuddin, surveyor, Irrigation Branch, Ufzal-ganj, Hyderabad, India, asking for information and books on irrigation engineering. The gentleman asks for suggestions as to the best book on irrigation and storage reservoirs, in which the principles and practice of irrigation are fully covered.

He also informs us that he is about to send his brother to America to learn electrical and mechanical engineering, and is desirous of securing information and full particulars as to the best college in the United States where studies of this kind may be taken up.

We are producing elsewhere in this issue the full letter from Mr. Barhanuddin, and while we will

endeavor to furnish information from this office, it is suggested that any of our readers who are in position to aid the gentlemen, either furnish us the information which may be forwarded to him, or correspond with him direct.

It should be remembered that the native engineers in India are studying development in this country so that they may better the condition of their fellow-countrymen, and they should receive every possible assistance from those in this country who are able to furnish it.

Sweet Clover Good Crop

In an article by August H. Vogeler, seedsman of Salt Lake City, which appears in this issue, it will be noted that he treats of sweet clover or Bokhara, looked upon by many, at present, as a worthless weed.

It is well known that farmers throughout central and eastern states try to clear it out of their land. Of late years it has been mowed down in the lightly traveled roadways where it had made good headway, particularly around gravel pits and road depressions which have been filled in with gravel and clay.

Mr. Vogeler states that one of the first questions asked in the old days when buying alfalfa seed was "Is it free from sweet clover?" He goes on to say further that in recent years sweet clover has become very popular, not because the plant itself has undergone a change, but that its value has become more generally known and better understood. He stated, moreover, that this is also true of many other plants which have heretofore been considered of no use or value to mankind.

Continuing, the article explains that some years ago the agricultural college of Wyoming made a lamb and sheep feeding test, and found that sweet clover was superior to alfalfa. This was a great surprise to all ranchmen and farmers who became acquainted with the work that was going on, and it will eventually materially change cropping conditions throughout the central and eastern states.

If sweet clover is as good for sheep as was clearly proven in this experiment, there is no reason why each small sheep raiser in Michigan, Wisconsin and various other states where wool and mutton form a part of the annual product, should not set aside a piece of pasture land and sow sweet clover seed for fodder.

Application has been made to the college in Wyoming for the bulletin covering the experiments along this line, and this bulletin will subsequently be published in full in the columns of the IRRIGATION AGE, so that those who may be desirous

of securing additional information will secure in serial form all of the data available up to the present time, resulting from this experimental work.

We urge all those interested to go carefully over the article by Mr. Vogeler in this issue.

Flood Control of Sacramento Valley.

In a recent talk before the Commonwealth Club of San Francisco, Major Sherwood A. Cheney, engineer corps, U. S. A., made the statement that it will be necessary to move 260,000,000 cubic yards of material, or about $1\frac{1}{4}$ times the amount excavated in the Panama canal, to take care of the floods of the Sacramento valley and reclaim 700,000 acres of land.

Reclamation and flood control of the Sacramento valley was the theme of Major Cheney's talk before that club, which is composed of representative men of San Francisco.

Major Cheney told of the scope of the work being done and that necessary in order to reclaim that quantity of land, which he states is the richest land in the world for agricultural purposes. For sixty years the people of the Sacramento valley have fought the floods of the Sacramento and Feather rivers, and in that time they have taken valuable land into their possession. Major Cheney states that some general plan is needed to make all of the land in the valley available for agriculture, and the one recommended by the California Debris Commission is to be followed.

"This land, without reclamation, is worth from \$10 to \$40 per acre for grazing purposes, and brings an income of from twenty-five to fifty cents. After it has been made safe it is worth \$250 per acre and its returns will be at least \$50 per acre annually," said H. W. Furlong, who also spoke before the club.

The bankers and business men of San Francisco were asked to awaken to the possibilities of this work, and what it means to the city that the reclamation bonds were purchased in the state rather than outside.

Where Will They Move Next?

We notice in a recent issue of the New Orleans, La., *Times-Democrat*, which goes thoroughly into the subject of the efforts of the Louisiana Reclamation Club, to obtain federal aid, that they devote considerable space to the National Reclamation Association, which has come to the front lately under the management of Mr. Booth, of Los Angeles, and George H. Maxwell.

The paper states that the entire equipment of the national headquarters of the National Irrigation

Association has been moved from Chicago, where it has been located for fourteen years, to New Orleans, and that the permanent national headquarters of the consolidated organization, the National Reclamation Association, has been established and will be permanently maintained in that city. It also states that *The Talisman*, a monthly magazine published in the interest of the association and circulated among the editors of the United States, has been located therein. It also states that Mr. Maxwell's office as executive director will also be there.

If the citizens of New Orleans will take the trouble to look into the history of the National Irrigation Association, and will inform themselves also, as to *The Talisman*, they will not be unduly elated over their prize. Maxwell's *Talisman* has been published with one main object—that of trying to boost George H. Maxwell and any idea which he cared to promulgate, or the ideas of various individuals throughout the country whose opinions suit his fancy.

The citizens of New Orleans will learn before long that this National Reclamation Association is a one-man institution, and will be dominated absolutely by George H. Maxwell. If they have any doubts about this, let them attempt to go against his wishes at any public meeting or in any fight for the passage of such bills as Maxwell may fancy will be the means of saving the nation.

It will be well for the citizens of New Orleans to look carefully into the practices of Mr. Maxwell, and the history of *The Talisman* and the new organization, before expending money or time on either.

Pinchot's Right Hand Man Glavis

The fact that Louis Glavis, recently secretary of the Conservation and Water Boards of the state of California, had private contracts with lumber companies aggregating \$40,000 to \$50,000 and has been deposed by Governor Johnson of that state, must be particularly interesting to the editor of *Collier's Weekly* and Gifford Pinchot, the so-called leader of the conservation movement.

Glavis is the man who furnished Pinchot with a lot of information which was so widely exploited that it resulted in the resignation of former Secretary of the Interior Ballinger. This information was used largely by *Collier's Weekly*, which was then supporting Pinchot and his coterie of friends who made the unjust and unwarranted attack upon Ballinger.

Recent information on the subject is to the effect that Milton U. Ren, secretary to Congressman William Kent of California, and who, like Glavis,

was employed by the State Conservation Commission to look after its interests at Washington, was likewise employed by Glavis in his private undertaking to obtain preferential listing of lieu lands for certain lumber companies.

An investigation was held privately in Governor Johnson's office in the month of December, 1912, but the full information was not given out until late in January, 1913.

The main facts of the hearing are contained in a letter from Governor Johnson addressed to both boards interested, suggesting that Glavis resign. Governor Johnson in his letter says in part: "Glavis with knowledge of the situation, entered into contracts with various lumber companies by which he agreed to have the lands to which they were entitled listed by the Federal government to the state; involved in these contracts are some 25,000 or 30,000 acres and Glavis would receive as compensation from his employers sums ranging from \$1.25 to \$2 per acre. The amount in value of his contracts aggregates probably between \$40,000 and \$50,000."

Thus crumble the supports to Pinchot's claims to greatness. This brings to mind a letter received some years ago by the editor in which it was intimated that he was evidently misinformed concerning the fight against Pinchot and his supporters. Our correspondent intimated that the AGE would lose prestige and subscribers if the fight was continued. We wonder what that correspondent and others who were supporters of Pinchot and his friends think about it now.

Raise Seed for Home Market

We are printing in this issue the first of a series of articles by August H. Vogeler, a well known seed grower and merchant of Salt Lake City, which treats of sweet clover or Bokhara. Arrangements were made with Mr. Vogeler sometime ago for a series of twelve articles along this line, and we count ourselves fortunate to have been able to induce so busy a man to devote the time necessary for their preparation.

August H. Vogeler is generally recognized as the leading and best informed seed grower and merchant west of Chicago. He is known among all of the seed men throughout the United States as an exponent of the theory of growing our own seeds instead of importing them. In many instances, American buyers secure seeds of inferior grades from abroad.

Mr. Vogeler stated to the writer, who met him during a trip through the west last year that the state of Idaho alone could produce all the seed necessary for use in this country if the farmers were made to understand the possibilities of the soil of that state, and

its unusual climate. He held that a better grade of seed could be raised in Idaho than has ever been produced in this country, and that the larger seed houses throughout the country were making contracts with land owners in Idaho for their product to distribute through the central and eastern markets.

It seems from Mr. Vogeler's statements to us, and we trust that he may elucidate that fact in a future article, that the particular soil and climatic condition of Idaho brings out cleaner and hardier seed than any other state in the Union.

At the time the writer traveled through Idaho with Mr. Vogeler we had the good fortune to meet Mr. I. B. Perrine, who is owner of the Blue Lakes ranch in the Snake River canyon, and who is also father of the Twin Falls country in the Snake River valley of Idaho.

Mr. Vogeler made the statement to Mr. Perrine that if he (Perrine) had followed his advice and had in the previous spring planted ten acres of his ranch to sweet peas he would have been ready at that moment to hand him a check for \$10,000 for the crop, which would have matured at about the time this conversation took place.

In this conversation the fact was brought out that owing to changing climatic or other conditions throughout the central and eastern states, it is impossible to raise sweet pea seed and bring it to maturity possessing all of the necessary qualities. It has been found essential, therefore, to look to other fields where this seed may be produced in large quantities and of excellent quality. It was Mr. Vogeler's idea that Idaho is particularly fitted for the propagation of seed of this and various other kinds, and that Idaho would eventually become one of the largest seed producing states in the Union.

Endorse Newell's Irrigation Work.

We note that the *Salt Lake Tribune* of February 12th takes a strong position editorially in defense of the recent attack on Director Newell and the work of the Reclamation Service.

In their comments they state, "We of the west know Mr. Newell very well, and have the utmost confidence in him, and we know that his enemies are those who simply were not able to influence him towards schemes which did not commend themselves to his judgment."

"We have recently been informed that a statement will later be furnished from Washington concerning the status of affairs in the Salt River Valley in Arizona."

Secretary Fisher affirms that he believes it is a good thing to have a periodical investigation of the

Reclamation Service, but that it should be carried on by a commission competent to judge of these operations, and which will hear the officials before it condemns them.

This is no doubt true, and we understand that there is a move on foot now to ask for an appropriation which will take care of the expenses of a commission that will make a thorough study of all conditions associated with the reclamation work.

This commission should be composed of not only a competent engineer, but some well known business men, who could study the business features of the various projects, and sufficient time should be given to allow a thorough investigation of every project under the reclamation service.

If a report could be furnished by a commission of this character, it would, no doubt, give all of the facts for and against the reclamation service, and place them before Congress so that each member of the House and Senate would fully understand the situation and would have some ground upon which to base an opinion independent of the reports which come to him from the individual constituent who has a grievance.

We all know that the reclamation service had difficult problems to solve, and it is generally well known, also, that work of this character was new to many of the engineers. How much has been learned, and what efforts have been made to correct mistakes of the early period of the work, would be fully brought out in a report by a rightly organized commission. It is the duty of Congress to pass either the bill presented by Senator Borah or some other bill which will permit the organization of a commission of this character.

We are informed that active investigations will be carried on by the department of justice as soon as funds are provided to cover the expense of this sort of work.

Should a bill pass which would permit the president to appoint a committee, there is no doubt that all other work in the way of investigation would cease until this committee had prepared and presented its report to the president and congress. Hence, we again urge the appointment of a commission of this character which may start to secure information at once.

Cannot Entertain Irrigation Congress The action of the various committees of the business associations of Phoenix, Arizona, in declining the offer of the National Irrigation Congress to hold its next session in Phoenix met, it is said, with the concurrence of the directors of the board of trade, which held a recent special

meeting that was attended by Arthur Hooker, secretary of the congress.

The main points brought out in the discussion held in Mr. Hooker's presence are those affecting the cost and expenditures of the congress. Several of the leading citizens of Phoenix supported a motion to accept the terms as offered, which made it plain that an expense of at least \$11,000 must be incurred to entertain the congress. Other members contended that not only more than \$11,000 would be needed but that the time of many of the leading citizens of Phoenix would be used in doing the work preparatory to entertaining the congress, and that their time would amount, in money value, to a great deal more than the sum asked.

In thus turning down the invitation which was extended to the congress at Salt Lake on the assurance that the expense would not exceed \$7,500, the Phoenix people have demonstrated that western states are getting tired of contributing large sums of money to pay high salaries for a secretary who is employed the year around, and whose work could all be accomplished in two or three months' time.

When Mr. Hooker was made secretary at Spokane it was done with the idea of favoring local influences, and to secure a secretary who would be subservient to the wishes of the Reclamation Service and the Pinchot element, at that time in control.

Hooker is an unobtrusive fellow and a very pleasant gentleman to meet, but has no particular qualifications for this office. All of the heavy work connected with each of the congresses for which he has acted in the capacity of secretary has been done by the local board of control. Mr. Hooker has shown no initiative nor has he demonstrated that he is sufficiently strong in leadership to control conditions which arise from year to year in connection with congress work.

The fact is a \$1,000 clerk would have accomplished as much as Mr. Hooker has done. There is no necessity of paying so high a salary as \$3,600.

It is generally recognized that his assistant did a greater part of the work, and she was paid in the neighborhood of \$1,200 per year for her services. The young woman was especially competent and could, no doubt, have done as much alone as was accomplished under the Hooker administration.

When the people of the west awake to a realization of the fact that the campaigns of the best congresses held were conducted by secretaries who received no salary, and in many instances no allowance for expenses, they will arrive at the conclusion that a secretary who fills the office for a period not to exceed three months, and whose expenses including salary and incidentals would not go over

\$2,000 or \$2,500 is a sufficient burden to load on any town that is willing to take on the other expenses incident to entertaining the congress.

There were, of course, good reasons why many of the western cities were desirous of entertaining the congress in past years. This was illustrated by the manipulation of affairs at Albuquerque; also by the conduct of the congress at Pueblo. There is no doubt that securing the congress for Sacramento saved for that city the capital, as there was a strong movement at that time to move the capital to Berkeley or some other more favorable point. Sacramento, through her energetic citizens, raised and spent something like \$55,000 to entertain the congress. Under the circumstances, it was a good investment.

Spokane spent considerable money, and if her chamber of commerce had fulfilled its obligations fully she would have spent more. They repudiated some verbal agreements which reduced the cost to them somewhat.

A report is current that Boise, Idaho, would be willing to put up the money and entertain the congress. It appears to the writer that holding the next congress at any particular town, would benefit mainly the secretary and his assistant. This has, in fact, been true of the last two or three congresses.

If Boise, Idaho, feels that it wishes to contribute the sum named for this purpose it is, of course, at liberty to do so.

The truth is, and we may as well face it, that the usefulness of the Irrigation Congress is ended. The great cause of irrigation will not be affected if this particular annual gathering is abolished.

In view of recent investigations in and around Phoenix, it is just possible that the people there prefer not to have too many investigators on the ground at present. May this have had something to do with turning down the congress?

We will attempt to keep our readers informed as to the attitude of other cities.

DIRECTOR NEWELL CONTRADICTS STATEMENT MADE BY JAMES J. HILL.

The attention of Director F. H. Newell, of the Reclamation Service was called to the alleged statement by James J. Hill printed in the Washington Post recently regarding the relative cost of government irrigation work. Mr. Hill is quoted as stating that this work cost twice as much as it should have cost, and twice as much as the same work would have cost in Canada.

"It is obvious from the statement made by Mr. Hill that he is not well informed concerning the actual cost of government and private irrigation work," said Mr. Newell. "A compilation of the cost of all of the irrigation works of considerable size recently built or in process of construction in

the United States by private and corporate capital, including in these over a hundred large systems, show that the average cost of water per acre is not far from \$60. On the other hand the average cost of the government works is about \$45. The government works, it is generally admitted, are better built, and what is far more important, have an assured water supply, while many of the private projects have taken large risks in this matter of securing a complete supply of water, especially during the low water periods.

"Mr. Hill's attitude is apparently that of a man who does not wish it to be known that the government has and is doing work on an efficient and economical basis. It is believed that a study by a competent and impartial man of the work performed by the Reclamation Service will show that, taking into consideration the requirements of the eight-hour law and other restrictions, the works have cost and are costing less than many of those constructed by private parties."

Mr. Newell went even further in this assertion, that taking work executed by the Great Northern Railroad and by the Reclamation Service, he believed it could be shown that in comparable work the results obtained by the government were as economical as those obtained under Mr. Hill's organization.

"It is a very popular notion, carefully cultivated by interested parties, that government work is necessarily extravagant, but like many other fallacies, no proof is offered.

"It is not to be expected that irrigation works in Canada would be as expensive as those in the United States. The industry is much younger there than in this country and the usual inexpensive projects that have long since been developed by private capital in the United States are just now being worked out in Canada. Moreover, the character of crops raised in Canada will not warrant the development of difficult and expensive projects. It is evident that a project depending upon the production of small grains and forage for its main returns cannot bear as high charges for water as can projects that depend upon fruits, truck, and diversified crops of higher value for their support. Another thing that has to be taken into consideration in making a comparison of the costs of irrigation works in the two countries is the fact that lumber is comparatively cheap in Canada, and is used to a much greater extent in the construction of irrigation works there than in the United States. The Reclamation Service structures are usually of concrete and steel.

"Taking these things into consideration it will be found that the cost per acre of land actually reclaimed in Canada is as high, if not higher, than that of similar private works in the United States, which have cost on an average more than like work being done by the government."

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.

IRRIGATION AND IRRIGATION SECURITIES

L. L. McCLELLAND, President J. S. & W. S. Kuhn, Inc.

Sufficient time has elapsed to enable a fairly close analysis of the actual results accomplished by irrigation during the past six or seven years. Much space was used in magazines and newspapers in 1906, 1907 and 1908, outlining the wonderful results to be obtained by segregating and developing the semi-arid lands in the western states, and making them "blossom like the rose" by means of irrigation. Reclamation enterprises inaugurated by the government naturally stimulated the interest of private individuals and of corporations in irrigation projects, and many companies, having aggregate capital running into the hundred millions, were organized with an expressed purpose of irrigating large tracts of land. The investing public was importuned to buy the securities of those companies and, for a time, there was a ready market therefor. As usual, there was no differentiation between companies which were organized for the purpose of selling securities or those which had the definite purpose of carrying out the promises made in their prospectuses. The idea was abroad that any project that had irrigation as its basis must necessarily be successful. Apparently little consideration was given to the time required to complete projects, nor of the great obstacles to be surmounted. The situation was complicated by the flotation of some companies whose organizers were not scrupulous, and the failure of a few houses which had marketed round blocks of securities naturally created a suspicion that irrigation was foredoomed to failure. At the beginning, there was considerably more enthusiasm than was warranted by actual conditions and, after failures occurred, opinion swung too far in the opposite direction.

Judging from the established record of irrigation, the proportion of successes compares favorably with that in any other new line of endeavor. A brief reference to the history of our manufacturing and transportation industries shows that, in their early days, failures were numerous and, in many instances, preconceived ideas had to be abandoned. But this did not prevent ultimate realization. Irrigation presented opportunities and difficulties encountered were not more trying than experienced by pioneers in other enterprises. Of course, ample capital, good business judgment and efficient management were imperative. Companies equipped therewith had more than an even chance of fulfilling promises. That a long list of companies organized when the movement was at its height in 1906, 1907 and 1908 has been definitely successful is apparent from official documents. For instance, the 1912 report of the Idaho State Land Department gives in detail results accomplished in that state. The amount expended by all companies from their inception to November 1 last was \$22,845,000. Several companies have been in operation for the past four to seven years and the wealth of the state has been

increased many fold by the settling and cultivation of lands within the irrigated districts. Irrigation has been a success in Colorado, in Washington, in Oregon, in California and in other states over a period extending from 5 to 25 years, and the value of lands within the areas affected by irrigation has risen enormously. The evidence demonstrates that failures have been almost exclusively due to (1) improper selection of land for irrigation, (2) to insufficient water supply, (3) to lack of experience, (4) to imperfect organization, (5) to poor management, and (6) to inadequate capital, and that success has been obtainable by the exercise of business acumen.

Irrigation is a business proposition pure and simple and should not be considered from any other angle. Success or failure depends on the same principles underlying other enterprises, among which might be mentioned sufficient capital, proper investigation, honest construction, capable organization and efficient direction. In irrigation, the physical success of the proposition does not necessarily mean financial and agricultural success. Dams, reservoirs, canals and ditches may be of the best possible construction, and abundance of water may be available for supplying all requirements of the acreage in the property. It is, therefore, highly important that the right kind of settlers be attracted to the land and also that the settlers be educated in proper methods in farming irrigated land. Herein lies the great advantage to holders of securities of companies owned, managed and operated by the same interests which brought out and distributed the bonds, and whose ultimate profit is primarily dependent on revenues derive after the retirement of the mortgages or ample provision made for their liquidation.

Underestimating the cost of construction has been a contributing factor in the failure of a number of companies, but the expenditure of three times the original estimate by one company in Southern Idaho did not prevent that corporation's success, because ample capital had been supplied, wise selection of land for irrigation had been made, and the management had met all requirements of the situation. This goes to prove that the exercise of sound business judgment in segregating the acreage and in securing abundant water supply more than recompensed for the greater expenditure in construction. The same statements can be applied to other projects with some modification. The three Kuhn propositions in Idaho were built for about \$750,000 under the original estimate of \$8,750,000, but an experience of over 30 years in public utility construction in all parts of the country gave their engineers an advantage not generally possessed.

Operation of irrigation companies embodies the same essential features as required in merchandising, manufacturing and transportation. Irrigation, as a business proposition, dates back to the beginning of time and its rewards have exerted no little influence in preventing prosperous and populous countries from becoming waste places. Crop failures are improbable when the irrigation system is properly handled. Ordinary carefulness assures abundant harvests at all times, whereas the non-irrigated farm yields according to the caprices of nature in the amount of rainfall annually distributed.

The contribution of irrigation to the value of the nation's food products and thus to the wealth of the country is steadily increasing. It is frankly admitted that mistakes have been made, which have beclouded the real issue, and which have been responsible for considerable prejudice that should not exist. Year by year achievements are gradually revising opinion, while investors are more nearly applying the discernment that should be exercised in the purchase of any security. Just as in buying bonds in general, the investor must display confidence in the issuing or distributing banking house. Bankers should be like Caesar's wife—above suspicion. The great majority of bond houses enjoy this distinction, acquired through prolonged experience and years of honorable dealing with the public at large. Investment losses would be much restricted if this were indelibly impressed upon the minds of people of small means, who are at least partly dependent upon a fixed and regular income for a livelihood.

The primary security behind the acceptable irrigation bond is the land itself. Statistics show that the great insurance companies have invested several hundred millions of dollars in farm land mortgages in the middle west, which, despite the ever-present possibility of drouth and of other uncertainties unknown in irrigated sections, have proved profitable investments. Obligations against lands under irrigation are surely just as valuable. In addition to the land, irrigation bonds are also an obligation against the system, with all its dams, canals, ditches, etc., and, also, covers all improvements on the lands until the settler completes his contract. In buying a farm, the settler makes an initial cash payment and gives a mortgage for the balance. The terms imposed require a certain portion on the principal annually, with the interest. These payments provide for interest on the outstanding bonds and also for retirement of the issue, which matures serially over a period of years. Naturally, the security is enhanced year by year (1) by the retirement of the bonds and (2) by the increased value of the land and improvements. No mortgage on any property is released until the terms thereof are fully complied with, and the total of the individual mortgages always liberally exceeds the amount of the unmatured bonds. Of course, these deductions assume that the proposition is basically governed by sound business principles.

The modus operandi of a well managed Idaho irrigation company gives the uninitiated an idea of what may be accomplished. The land and water rights originally sold at \$35.50 per acre and were bonded at the rate of \$25 per acre. The average improvements on the tract are estimated at \$45 per acre, making an investment by the settler of \$80.50 per acre. This would be an excellent security for a bond maturing at a long distant period in the future. But the retirement of the bonds as due has narrowed the debt to \$18.50 per acre, which affords an equity nearly $4\frac{1}{2}$ times the present obligation upon the land. In other words, the original equity of \$10.50 per acre has been increased to \$62, or 298 per cent of the loan, without any consideration being given to the enhancement in value. When it is remem-

(Continued on page 163)

A NOVEL DRAIN.

To provide proper drainage for irrigated lands where an outlet for the surplus water has not been made by nature, sometimes becomes a difficult problem, and it may interest the many readers of the IRRIGATION AGE to learn of one method by which this was accomplished.

Charles E. Opel has a ten-acre tract under the Western Land and Irrigation Co.'s ditch, $2\frac{1}{2}$ miles north and west of Hermiston, Oregon, on the west side of the Umatilla River, set with apple trees of standard varieties.

The overflow from the higher adjoining tracts finds its way upon a small portion of this tract. There being no natural outlet for this surplus water, at the suggestion of Mr. J. S. West, a skilled mechanic, a novel drainage system was installed by Mr. Opel.

The water is collected by under-surface drains and conducted to a well or reservoir 7 feet deep. From this reservoir a two-inch iron pipe line 1,250 feet long extends up and over a raise of land 17 feet higher than the reservoir to a point sufficiently low to utilize the principle of the siphon. After being primed, this siphon produces a constant flow over the hill so long as there is water in the reservoir.

Provision has been made for reducing the flow when the full capacity is not required and an air trap has been constructed to avoid any trouble from slight air leaks in the pipe.

The system has been working for some time and attracts considerable attention and favorable comment from persons experienced in irrigation and drainage.

The principle of the siphon is not new and is well understood, being frequently made use of in an inverted form, in irrigation projects, but there is not likely another system like this one, where the siphon is used in its ordinary form, for practical use for a similar purpose, in the Northwest.

Working as it does night and day, without any expense to the owner, it is probable that this system will be investigated and installed by many having similar conditions to overcome.

HIGHEST AND LOWEST POINTS IN THE WORLD.

The maximum difference in elevation of land in the United States is 14,777 feet, according to the United States Geological Survey, Mount Whitney, the highest point, is 14,501 feet above sea level, and a point in Death Valley is 276 feet below sea level. These two points, which are both in California, are less than 90 miles apart. This difference is small, however, as compared with the figures for Asia. Mount Everest rises 29,002 feet above sea level, whereas the shores of the Dead Sea are 1,290 feet below sea level, a total difference in land heights of 30,292 feet. Mount Everest has never been climbed.

The greatest ocean depth yet found is 32,088 feet, at a point about 40 miles north of the island of Mindanao, in the Philippine Islands. The ocean bottom at this point is therefore more than $11\frac{1}{2}$ miles below the summit of Mount Everest.

The difference in the land heights in Europe is about 15,868 feet.

James H. Brady

James H. Brady, eighth governor of Idaho, was born in Indiana County, Pennsylvania, June 12, 1862, son of John and Catharine (Lee) Brady, of Scotch-Irish and German stock, and a descendant of Hugh Brady, who married Hannah McCormick, and the line of descent is traced through their son James, who married Rebecca Young, and their son James Young, who married Sarah Rickets, and was Governor Brady's grandfather. Two sons of the emigrant, Hugh Brady, Capt. Samuel Brady and Gen. Hugh Brady, distinguished themselves as soldiers, the former as an Indian fighter, whose name became a household word for bravery and resourcefulness in western Pennsylvania during the early years of the nation, and the latter as a Colonel in the war of 1812.

James Young Brady, the governor's grandfather, settled on a farm in Indiana County, Pa.,



U. S. Senator James H. Brady.

and served there as a justice of the peace for forty-three years. His son John engaged in farming and stock raising in the same county, cultivated a farm in Marion County, Pa., for a time, and finally took his family to Johnson County, Kansas, where he purchased a farm within twenty miles of Kansas City, Mo. Here he became active in politics and soon was honored with many high public positions, and often called upon to settle disputes among the Kansas pioneers; he was commonly referred to as Judge Brady.

The subject of this sketch attended the public schools of the district and the Leavenworth Normal College. He taught school for three years after receiving his diploma, fitting himself in the meantime for the practice of law. After editing a semi-weekly newspaper for two years, he embarked in the real estate business with offices in St. Louis, Mo., Chicago, Ill., and Houston, Texas, and was successful from the start. While thus engaged, he became acquainted with the wonderful irrigation and power possibilities of the State of Idaho, and he settled there in 1895. He was identified with the upbuilding of the Snake River valley, which included the construction of the Idaho canal, the Marysville canal and the Fort Hall Indian Reservation canal. He also became interested in the electric development of the water power in southeastern Idaho, and he is president and principal owner of the Idaho Consolidated Power Company at American Falls, which owns and controls one of the largest power plants in the state.

Governor Brady has been active in public affairs from early manhood. The same energy and executive ability which he displayed in his business enterprises distinguished him as an organizer and leader in the Republican party, and his foresight, shrewdness, business intelligence and capacity for work became a valuable asset to that party in Idaho after he went to that state. He was a delegate to the Republican National Convention in 1910; chairman of the Idaho delegation to the Republican National Convention of 1908, and a member of the delegation from that convention to notify William H. Taft of his nomination at Cincinnati, Ohio; vice-president of the National Irrigation Congress, 1896-98, and a member of its executive committee 1900-04. As chairman of the Republican State Central Committee of Idaho in 1904 and 1906, he was the acknowledged leader of the party in the state, which nominated him by acclamation its candidate for governor in 1908. He was elected November 3d of that year by a magnificent majority. Governor Brady was a strong adherent of the direct primary and the local option bills, and was largely instrumental in their enactment into law. The former provides for the expression of the people's choice for United States Senator. Among other legislation enacted during his administration were an amendment of the law regulating the period of employment in underground mines, an employer's liability law, and a law prohibiting wholesale liquor dealers being interested in places doing retail business. Provision was made for the care and protection of orphans and of homeless, neglected or abused children; and for the indeterminate sentence of persons convicted of any felonies, except treason and murder in the first degree. Many other measures for the advancement of the state were advocated by Governor Brady. He contributed privately both time and money to almost every movement which had for its purpose the betterment of the state. His most striking characteristics, besides his keen foresight, are a truly inspiring activity and genuine public spirit.

Governor Brady is a member of the Pocatello Commercial Club; Boise Commercial Club; Salt Lake City Commercial Club, Rocky Mountain Club of New York; President of the Western Develop-

(Continued on page 165)

NEW GRAINS FOR THE ARID REGION.

By Arthur Chapman.

There is a wide strip of high plains land east of the Rocky Mountains, which is capable of filling the depleted granaries of the world, if science can fit it with a drought-resisting cereal. Roughly speaking, this strip consists of about one-sixth the total area of the United States. It has produced millions of cattle and sheep, but no grazing country can ever be a great country, and it is recognized that until this strip, extending from the Canadian line to the Mexican border, becomes productive in the highest sense of the word, it must represent a vast economic loss to the United States.

Irrigation has gone about as far as it can go in this strip. Dry farming is practiced with varying success. It has come to be generally accepted today that some new food-producing plant must be developed which will fit this strange environment in which high altitude and excessive drought combine to defeat those who attempt to raise the ordinary grains of commerce.



PROF. B. C. BUFFUM.

More than twenty years ago Robert Gauss, a newspaper man of Denver, grandson of Germany's most eminent mathematician, began a series of experiments with wheat with the hope of developing a drought-resisting plant. Mr. Gauss carried on his experiments for several years, but, unable to find aid, was forced to give up on account of the question of personal expense. He wrought such changes in his wheat, after successive plantings, that other men of science became interested, and today the development of a drought-resisting wheat, or some similar cereal, is the ambition of many scientists. Experimenting with the drought-resisting qualities of many plants is the chief work at the Carnegie Desert Laboratory, at Tucson, Arizona, as well as at various government experiment stations and agricultural colleges in the West.

The most important work in recent years along this line has been accomplished by Prof. B. C. Buffum of Worland, Wyoming. When Russian emmer was introduced into this country Prof. Buffum recognized that here was a plant which might be depended upon to extend the food-producing area of the West. After several years of experimenting, he has produced an improved emmer, which, though a true mutation or "sport" of the common Russian emmer, is so greatly superior to the parent stock that the new product will hardly be recognized as belonging to the same family. It is larger, darker in color, heavier in the straw and head, and is much more prolific under arid land conditions than the original type.

Heretofore the securing of sports or mutations has been considered entirely accidental. They have simply happened, and the reason for them has not been understood. In Prof. Buffum's work he has succeeded in deliberately producing mutations, and, though the character of the changes secured may be a matter of surprise, their value is none the less real. Prof. Buffum has found that mutations are particularly valuable in close-fertilizing small grains, for when once secured they come true to type for an indefinite time.

The same conditions which help produce mutations seem to be of value in the work of crossing. Prof. Buffum has secured wheat-emmer hybrids, the value and qualities of which have not been yet determined, but there is no doubt that some of them will prove important additions to western agriculture. The first of these wheat-emmer hybrids caused such a remarkable breaking up of the wheat and emmer characters that the result was considered purely accidental. A second cross, however, under the same conditions, has given the same wide variations, even to the second generation. Usually the result of a cross is a plant which, in the second generation resembles one or the other of its parents, or proves intermediate. In the wheat-emmer hybrids produced by this Wyoming wonder-worker, intermediates are absent. Prof. Buffum has reversions to all the previous known types of these grains, and many forms, both good and bad, which seem to have no precedent. This breaking up of the species has given unparalleled opportunity for the selection and fixation of improvements. For example, from the first successful cross of winter wheat and winter emmer Prof. Buffum has now planted forty-two types of beardless winter emmer and also numerous types of a new grain which is so different that it will stand as a new species.

Prof. Buffum conducts the most remarkable experimental farm in the West at Worland. He has one hundred and eighty selections of winter grains now growing, and has secured interesting and important results in breeding other plants, more particularly alfalfa and potatoes. He has developed a new beardless winter wheat which seems to be even more hardy than the winter emmer, or even winter rye. It has been planted as far north as the government experiment farm at Alberta, Canada, where it has proved its hardiness under extremely adverse conditions.

If the plateau region of the west realizes the predictions of those who believe that its millions of unproductive acres will eventually become productive through plant adaptation, the credit must go to those like Prof. Buffum, who have approached the work of agricultural revolution in true scientific spirit.

SUN POWER PLANT IN EGYPT.

- By Frank C. Perkins.

The new sun power pumping installation in Egypt as designed by Mr. Frank Shuman, an American engineer, may be noted in the accompanying illustration. The reflectors and generators of sun power plant in Egypt differ from the Philadelphia steam generators, in which plane mirrors are used. In the Egyptian plant the reflectors are parabolical and the power is said to be much greater, or one hundred as against about thirty.

The Egyptian plant is located at Meadi, a suburb of Cairo, on the road to Helouan, and the steam generator part of the installation covers a great deal of ground, as there are five reflectors, each 204 feet long, the cross section being in the form of a parabola with the generator units at the focus.

They are made of zinc, of rectangular section, 14 inches wide, with sides only $\frac{3}{8}$ inch apart, and is painted with a special black paint of high heat absorbing qualities. The glass plates and the insulators used in the original plan have been discarded and at the upper edge the generator is enlarged into a steam collector 4 inches in diameter, and it has a fall of 6 inches in its length of 204 feet, the collector being connected to the main steam pipe at the upper end and the feed water introduced at the lower end.

The sides of the reflector are lined with silvered glass mirrors ranging in size from about a square foot at the mouth to a quarter that size near the vertex. The reflector and boiler are carried on high braced steel cradles, the outer circumference of which is in the form of a segment of a circle and has a rack attached, gearing with a pinion which serves to rotate the reflector so that it may always face the sun. The main engine furnishes the power for this operation through a pair of friction pulleys, which are put in gear by a special regulator, of which a thermostat is an important part.

The reflectors follow the sun automatically through the day. There are only five banks of heaters in this entire plant, instead of the twenty-six used in America, and they have been put widely apart so that no one shall shade another, an extra hour of sunshine at each end of the day being thus saved.

Dust is a troublesome matter in Egypt, and with it in view, provision has been made for tilting the whole generators to one side and washing them off with a hose. It has been found best to work with a pressure slightly below that of the atmosphere and corresponding to a temperature about 200 degrees Fahr. In order to use this low pressure steam efficiently the inventor has designed an engine which has given exceedingly good results under test.

A surface condenser is used, the vacuum being obtained before starting the plant by running the air pump with a small petrol motor, which is stopped as soon as the vacuum is obtained and the main engine is operating. In reference to the generation of mechanical power by the absorption of the sun's rays, Mr. Frank Shuman points out the fact that the direct utilization of the natural forces in the development of power suitable for human

activities has been for centuries a matter of continued scientific research. While to a limited extent these forces have been used from the dawn of civilization in the common forms of the windmill and various types of water driven motors.

It has not been hitherto possible to practically utilize the central dominating forces of nature—the sun heat—in any direct manner, though obviously all power generators are dependent upon this great source for their existence. Although for many years engineers and physicists have been occupied with this problem, notably John Ericson, Ferry, Mollochan, Mouchat and Tellier, in France; Guntner and Althaus, in Germany, and Langley and Willsie, in America.

They based their efforts either upon the use of lenses or mirror to concentrate the sun's rays upon a small surface, or upon the heating of fluids of a low-boiling point, with subsequent power generation from the vapor under pressure. It has always been attempted to create vapor at high pressure, and then utilize this in the ordinary engine, with the high temperatures involved, the losses by conduction and convection are so great



Sun Plant in Operation in Egypt.

that the power produced was of no commercial value.

Where lenses or mirrors are used, the primary cost of the lenses and the apparatus necessary to continuously present them toward the sun, have rendered them impracticable. Where fluids of low-boiling point, such as ether, sulphurous acid, and liquid ammonia, were used, the results were of little value by reason of the inherent inefficiency of these fluids as power generators. Mr. Shuman holds that a sun-power plant, in order to be practicable, must possess, first, high efficiency, low cost of installation and maintenance, well marked length of service, and should not require specially trained mechanics for its operation. In order to be efficient, it is not necessary that the plant generate continuously, inasmuch as the great value of such a plant lies in its use as an irrigation apparatus; it is only necessary that the plant run about eight hours daily.

It must, however, consist of units which may be assembled to produce a power plant of any required size, the larger the plant the greater the efficiency. It is entirely practicable to produce a sun power plant in this manner up to 10,000 horse-

power and over. An ideal plant must be subject to a little accident, hence it must lie near the ground in order not to be affected by storms and winds.

Each unit must be repairable without stopping the operation; construction must be simple and easily understood by the ordinary steam engineer; and wear and tear must be reduced to a minimum. The first cost of a sun-power plant to be practical and of commercial value, must be sufficiently low so that the interest on the investment does not make it unprofitable. This is the rock, on which, thus far, all sun-power propositions were wrecked. It is not necessary that the cost of the sun heat absorber shall be as low as that of a steam boiler and fitting of the same power. The cost of the plant described herein is twice that of the ordinary steam power plant of the same size.

This price is sufficiently low, however, so that even if the extra interest is taken into consideration, the fact that after installation no fuel is required, is such an enormous advantage as to entirely offset the increased cost, and in addition cause great profits. A decade ago Mr. Shuman became interested in the problem of obtaining power by absorbing the sun's rays. It was found, by experiment, that if a vessel were so arranged that the sun's rays could impinge upon it, and if all heat losses by conduction, convection and radiation were prevented by a theoretically perfect method of insulation, the temperature within the vessel would rise certainly to a thousand degrees Fahr. without any attempt being made to concentrate the rays of the sun.

For commercial purposes it is impossible to secure any form of insulation which would even approach the theoretical. Commercially, the main object is to produce practical power at a minimum cost, and this has been done by the use of well-known and cheap forms of heat insulation.

Were no steam made in these vessels as they are arranged in the present plant, the temperature therein would be up to 350° Fahr. in the latitude north, possible easily to 450° hard near the equator. The production of steam at atmospheric pressure, however, keeps the temperature in the vessels down to 212 and whatever excess of heat is produced by the sun's rays over and above that lost, is converted into steam, and many therefore be utilized.

No doubt sun power must go through the same long and gradual course of development that has brought other forms of mechanical power to the present high plane of efficiency, but the principle will remain fundamentally correct.

The first Shuman generator consisted of a wooden box covered by two layers of glass, between which was a small air space, and in the box was placed a miniature ether boiler. This apparatus was exposed to the sun's rays, the ether distilled, and the amount of heat which might be absorbed was determined. As an experiment, a small toy engine was successfully run with this original apparatus.

A second generator consisted of a 2-inch steam pipe 17 feet long, insulated at the bottom, enclosed in a box covered by a double layer of glass. Here again ether was distilled, and the number of heat units absorbed were determined. A third type of power plant was composed of a bed of water pipes properly insulated against heat loss, the unit being

18x60 feet, and the motor being another engine. With this apparatus 3½ horsepower was obtained. With the knowledge so gained, the next generator to be described below was gradually evolved. The sun-power plant consists of the absorber, a low pressure steam engine, condenser and auxiliaries.

In this sun-power plant the absorber was composed of a series of units each containing a flat metal honeycomb water vessel, rectangular in shape, and resembling closely a large waffle. This vessel was enclosed in a flat wooden box covered with two layers of glass having a one-inch air space between them, and having the under surface of the box insulated against heat loss downward by a 2-inch layer of regranulated cork and two layers of waterproofed cardboard. The boxes were mounted on supports which elevated them some 30 inches above the ground, and which permitted them to be inclined perpendicular to the sun at the meridian.

Plane mirrors of cheap construction were mounted on two sides of the boxes in order that more rays of the sun might be absorbed and reflected upon the surface of the water vessel. This latter is connected at one end to a feed pipe from the water supply, and the other end to a steam pipe. The steam pipes from the various units are connected together and empty into a main 8 inches in diameter in the present plant, which conveys the steam to the engine. The engine used was a new type, low pressure, reciprocating steam engine of great steam economy.

Connected with it is a condenser of ordinary type, and auxiliaries such as may be found in any condensing plant. The water from the condenser is pumped back into the absorber, thus insuring a continuous closed circuit, whose only water loss is from accidental leakage, which is carefully guarded against. The power of this first plant was used for pumping water by means of a reciprocating steam pump of the ordinary type, and whenever the sun shone this plant pumped water successfully and practically.

The capacity of the plant was 3,000 gallons of water per minute, lifted to a height of 33 feet. From actual tests made in Philadelphia it was found that from the absorber of 26 banks of units each containing 22 single units and having a light absorptive area of 10,296 square feet and an actual area of 5,148 square feet, there could be developed during eight hours 4,825 pounds of steam.

The power produced was much lower than normal to the plant, as it was built for tropical use and was entirely unfitted for commercial work in northern latitudes. The loss of heat by conduction and convection in northern latitude is enormous. When the present apparatus is placed in an average air temperature of 100° Fahr., such as obtained throughout all equatorial regions, power is multiplied threefold.

The immediate opportunities for sun-power are in those regions in the tropics where the sun practically shines throughout the year, and fuel is very expensive, coal costing in some localities \$30 per ton. Mr. Shuman has stated that there is room now for at least half a million horsepower in such tropical fields as the nitrate district of Chile, the borax industry in Death Valley, and for general purposes

in places where the outside temperature runs from 110° to 140° Fahr.

As an irrigation engine there is no limit to the amount of power that can be practically utilized, and for this purpose the conditions need not be so very favorable as those mentioned above. Throughout most of the tropical regions sun-power will prove very profitable in irrigation. One advantage of the sun-power, or in fact, of any condensing plant for irrigating purposes, is that the water used for the condenser costs nothing, as the main output of the engine can be passed through the condenser first before entering the irrigating canals. It is pointed out that the interior of Australia was, at one time, a fertile country, as is evidenced by the fossilized trees. Here is an area of some 600 miles in each direction which is entirely valueless. During a drought there have been times when one-third of the sheep raised on the margins of this desert died from thirst, causing great financial loss. In this locality the sun shines with an intensity sufficient to produce an average daily temperature of 100° to 140° F. The occasional rains nourish the sparse vegetation necessary for sheep, which are watered from wells driven in the ground and pumped, generally by horse power, very often by hand power, and sometimes by means of fuel oil, which, by the time it reaches its destination brings the coal equivalent up to some \$20 per ton. By building sun engine in this region, and pumping from the always present underground water which in this region lies at a depth of from 15 to 40 feet, this country can be made productive and valuable. Throughout Eastern India and Ceylon many thousands of square miles of farm land can be improved three-fold by mechanical irrigation. Hand pumping is mainly the present form of irrigation used.

In Egypt agriculture depends entirely upon irrigation furnished by the River Nile through its periodic overflow. The English government built the Assuan Dam at an enormous expense, and widened the irrigable area about half a mile on each side of the Nile, thus adding greatly to the tillable portion of Egypt. Of course, when the Nile is in flood infinitely more water than necessary is furnished, but the demand is for a supply which can be depended on from day to day, especially at seasons of low water. This supply at present is furnished by the hand labor of some 100,000 fellaheen, who pump by means of a shadoof method. The sun engine now installed and working in Egypt does the work of about a thousand of these laborers.

Throughout Arizona, Nevada, New Mexico and Southern California there is room for any amount of power for irrigating purposes alone. These states show an average of 90 per cent sunlight, and the cost of fuel is practically prohibitive in most of this region. It is held that 10 per cent of the earth's land surfaces will eventually depend upon the sun power for all mechanical operations. Given inexhaustible power, which is, of course, always obtainable from the sun, and utilizing the nitrogen in the air for fertilizer in the form of nitrates and such compounds as calcium cyanamide, the human race will be enabled to draw directly on the source of all life for power and sustenance. In this sun-power plant, the

engine, condenser and the ordinary steam boiler are to be compared.

It is found that at this time the initial cost of the sun-heat absorber in question is about double that of a first-class boiler plant of equal power. The great economy occurs in the item of fuel. In districts especially suitable for sun power the cost of coal, or its equivalent, is usually very high, the price ranging generally from \$10 to \$30 per ton. To offset this, no fuel at all is required by the sun heater. In the matter of maintenance and repairs, also, the advantage lies with the sun power. It is estimated that the repairs should not be in excess of 5 per cent per year on the initial cost, inasmuch as the apparatus works at low temperature, while the ordinary boiler requires flue fuses up to 2,500°. This wear of the parts must manifestly be much greater in the latter form of the power plants. Many parts of the sun-power plant, such as the metal heaters, piping, foundation and insulation are practically everlasting, barring accidental breakage; the only item of repair being the wooden frames and glass covers, and it is found that after an installation of glass has once been tested out by the heat and the badly annealed sheets replaced, the remainder will last for years.

This was evidenced by the small 18 by 60 heater in operation for three years in Philadelphia. There was a replacement of about 10 per cent, necessary during the first three weeks; thereafter the heater ran three seasons and only two or three sheets of glass needed replacement, these being accidentally broken. Mr. Shuman holds that the future development of solar power has no limit.

Where great natural water power exists, sun power cannot compete, but sun power generators will, in the near future, displace all other forms of mechanical power over at least 10 per cent of the earth's land surface; and in the far distant future, natural fuels having been exhausted, it will remain as the only means of existence of the human race. There seems to be no question but that the Egyptian sun power plant has satisfied all of the claims of the inventor and has demonstrated the successful utilization of the sun's heat for irrigation service in tropical countries.

CORRESPONDENCE.

January 30, 1913.

From
Syed Barhanuddin,
Surveyor Irrigation Branch,
Care Syed Gous, Esq.,
High Court Pleader,
Ufzalganj, Hyderabad (Decan), India.

Editor IRRIGATION AGE, Chicago.

Dear Sir:—I am given to understand by Messrs. W. & G. Foxe, book-sellers at London, that your journal is the best one on Irrigation Engineering. I wish to become a subscriber of the magazine. I shall be greatly obliged if you send me a specimen copy of the paper and also inform me of its yearly subscription.

Will you kindly suggest any best book on "Indian Storage and Reservoirs" in which the principles and practice of irrigation are fully dealt?

I wish to send my brother to America to learn electrical and mechanical engineering. Will not be kind enough to let me know about the full particulars of the best college in the U. S. A. which you would suggest? Kindly send me a copy of the prospectus of the college, if you can. What may be the average expenses as regards boarding, lodging, fees of the college, etc. In case you are unable to send me particulars please let me know from whom I can obtain such information.

I believe you wouldn't mind sending me the regulations of the University of Chicago.

I hope that I will receive an early reply.

Yours faithfully,
(Signed) SYED BARHANUDDIN.

SWEET CLOVER OR BOKHARA.*(Melilotus Alba.)*

By August H. Vogeler, Salt Lake City, Utah.

For many years sweet clover was looked upon as a noxious weed, and one of the first questions asked when buying alfalfa seed was, "Is it free from sweet clover?" In the past few years sweet clover has become very popular, not because the plant itself has undergone any change, but its value has become more generally known and better understood. This is also true of many plants that we consider of no use to mankind, but each one of them is here for a special purpose. Four or five years ago the Wyoming college made a lamb and sheep feeding test and found that sweet clover was superior to alfalfa. About this time the farmers of western and northwestern Nebraska began to use it as a fertilizer. In some parts of Nebraska the soil is more or less sandy and by plowing under the second year's growth they increased their yield on wheat as high as nine to fourteen bushels per acre.

Rasmuss Hoff, one of the foremost agriculturists of the state of Idaho, said, "I had ten acres of sweet clover, on which I pastured all summer, seventeen head of milk cows. Not only did I increase the flow of milk and got a higher percentage of butter fat, but the cows gained in weight."

The plant is a biennial and bears a close resemblance to alfalfa, but is larger and coarser in every way. It will make an excellent growth on lime lands, on stiffest clays, or on soil so hard and barren that it will no longer sustain other vegetation. It makes only a moderate growth and seldom blooms the first year, but during the second year it grows from four to seven feet high, making stronger and heavier roots than any other forage plant. At the end of the season it matures its seed and dies out, the roots decaying soon after. On account of its strong odor, sweet clover is not liked very much by stock at first, but since it starts very early in the spring when other forage is scarce, animals turned into a pasture of it at that time soon acquire a taste for it and eat it readily throughout the remainder of the season. Stock at any time turned in a field of sweet clover will never bloat on it as they do on other clovers. When grown for hay one crop and sometimes two can be cut the following summer and fall; the following year two and three crops may be cut. Unless cut early, just before it begins to bloom, the stems become hard and woody. Great care is needed in harvesting the hay as the leaves drop readily from the stems. The best time to handle it is early in the morning when the dew is still on. An excellent hay can be made if taken care of as suggested. While sweet clover hay will not sell as readily on the market, it can be used to advantage on the farm. It will not only furnish an excellent pasture in the spring, but a heavy crop throughout the growing season. The roots are very long, penetrating the soil to a depth of three to four feet, are quite large, and being fleshy decay more rapidly than alfalfa roots, hence their nitrogen becomes more quickly available for other crops. As they decay at the end of the second season they add a good supply of humus, also

leave the soil with minute holes which act as drains. If cut before it ripens the seed will not spread. However, it will reseed the ground thoroughly if not cut in due time.

Sow about ten to fifteen pounds per acre. It is best to sow the hulled seed for the unhulled is very slow in germinating. It is difficult to get the seed straight, the plant growing largely in irrigated districts, and is as a rule, slightly mixed with alfalfa seed. This, however, is not detrimental.

Sweet clover is a good green manuring crop to use in bringing up the value of old fields, barren, or washed places where a large amount of nitrogenous organic matter is desired. It is also one of our best honey plants, as its flowers produce an abundance of nectar. Some beekeepers estimate the value in honey alone of one acre sweet clover at \$20.00 to \$25.00.

I believe I make no mistake in recommending the cultivation of sweet clover for pastures, for hay, and for renovating worn out lands and worthless soils.

CLASSIFICATION OF THE PUBLIC LANDS.

An important and interesting effect upon the scientific work of the Geological Survey has resulted from the work in land classification. The constantly increasing demand for both completeness and exactness of information regarding the mineral resources of the public lands under classification have developed methods and scope of view in this economic work that have exerted a marked influence on the geologic work in other areas.

Thus, the training and methods developed in the course of the classification of the coal lands have brought about higher standards of refinement in stratigraphy, as well as in economic work, in other regions of the country. Another very notable illustration of scientific results springing from the study of economic problems is found in the administration of the Weeks Act, providing for the purchase of the Federal Government of certain forested lands which may affect the flow of navigable streams. The intensive hydrometric experimental studies carried on in order actually to show, in accordance with the terms of the law, the degree of protection afforded by forests to soil and water in certain areas proposed for purchase as national forests have resulted in empirical determinations and demonstrations of high scientific value as well as of tangible economic importance.—[From Annual Report, Director United States Geological Survey.]

ANNOUNCEMENT.

Mr. J. E. Bond, formerly chief engineer of the B. M. Osburn Co., and R. C. Wise, formerly mechanical engineer of Henion & Hubbell, have taken active charge of the Western Pump & Engineering Co., recently organized, with offices at 339-343 Railway Exchange building, Chicago. The company will handle principally the "McGowan" pumps.

Both are university men and have had a combined practical experience of forty years.

Supreme Court Decisions

Irrigation Cases

AGREEMENT TO FURNISH WATER.

An irrigation company, on acquiring a right of way over plaintiff's land, entered into a written contract by which it agreed to furnish him four cubic feet of water per second, to be delivered from boxes to be constructed and maintained by the company at places upon its land designated by plaintiff not exceeding eleven in number, "provided the total capacity of all of said boxes shall not exceed four cubic feet of water per second," and that the grantor should have the right at all times to open and close the boxes as he wished. *Held*, in an action for an injunction and for damages, that plaintiff, in order to secure the delivery of the agreed amount of water, was not required to use all the boxes at the same time, running at their full capacity to supply the total amount, but was entitled to use such of the boxes as he might wish, the total capacity of which should not exceed four cubic feet of water per second. *Animas Consol. Ditch Co. v. Smalkwood*. Court of Appeals of Colorado. 125 Pacific 594.

IRRIGATION CHARGES.

Where a water rate was duly and regularly fixed by a board of commissioners for the year 1901, and after being attacked by the canal company upon the ground that the rate was too low, and the order of the board of commissioners fixing such rate was subsequently affirmed and approved by the court, and in 1903 the company petitioned the board to establish a new rate, and the board of commissioners after a hearing established the same rate that had been established in 1901, and upon application of the canal company such rate was vacated and set aside by the court as being too low, and no further action was taken by the board of commissioners, and the matter was not further called to the attention of the board by the canal company, *held*, that the old rate established in 1901 remained in force and effect until a new rate was established, and that the canal company could not charge and collect from water consumers an additional water rate established and exacted by such company which was in excess of the rate established by order of the board of commissioners in 1901. *Green v. Jones*. Supreme Court of Idaho. 126 Pacific 1051.

IDAHO IRRIGATION STATUTE.

Rev. Codes Idaho, § 1644, subd. 12, which exempts from taxation irrigation canals and ditches and appurtenant water rights used by the owner exclusively for the irrigation of lands owned by him, must be limited in its application to cases where the land on which the water is used is situated within the state. Such statute, however, fairly construed, applies to and exempts irrigation works owned by a corporation, the stockholders of which own the lands irrigated; but under a provision herein that, in case any water is sold or rented from any such canal or ditch, the same shall be taxed to the extent of such sale or rental, where the corporation which constructed the works sold all the land irrigated, with a perpetual right to

a certain quantity of water thereon, retaining ownership of the works and water right with the right to sell or use any surplus and to collect a fixed sum from each user to cover maintenance and operating expenses, the works are taxable. *Spokane Valley Land & Water Co. v. Kootenai County, Idaho*. U. S. District Court, District of Idaho. 199 Federal 481.

WELL DRILLING CONTRACT.

Where a well driller, under contract to drill a well until he found water and to find water or receive no pay, drilled 59 feet after discovering water which flowed at the rate of $3\frac{1}{2}$ gallons an hour, he thereby conclusively showed that he understood the term "water," as used in the contract, to mean water in appreciable quantities; and the contract was to be construed in accordance with this understanding. *Turner v. Hartsell*. Court of Appeals of Alabama. 58 Southern 950.

ADJUDICATION OF PRIORITIES.

In contests involving the rights of rival appropriators of the waters of a river, it was error to deny a certificate of appropriation to contestees, where their grantor had complied with the law in force when she filed her statement and claim for a water right, where the water had been applied to the land which was reclaimed and cultivated thereby, her right had never been declared forfeited, and no attempt had been made to forfeit it, and where contestees were in possession of the ditch at least jointly with contestant, and were and had been for years using it to irrigate their lands. *Collett v. Morgan*. Supreme Court of Wyoming. 128 Pacific 626.

CONTRACT TO PURCHASE PUMPING PLANT.

The contract of an irrigation district to purchase a pumping plant, by which it agreed with the seller as to the basis of the amount of bonds needed, and bound itself to complete the purchase as soon as it could legally do so after the approval of the state engineer, and then without delay to call an election for voting the bonds required to pay for the pumping plant, though dependent on the approval of the state engineer and the election, was not thereby rendered ultra vires. *Board of Directors of Payette-Oregon Slope Irr. Dist. v. Peterson*. Supreme Court of Oregon. 128 Pacific 837.

CHANGE OF PLACE OF USE.

A change of the place of use of the waters will not be permitted where to do so will damage another appropriator. *Hall v. Blackman*. Supreme Court of Idaho. 126 Pacific 1047.

WATER RATES.

Where a water rate has once been fixed by a board of county commissioners in conformity with the statute, and the means is provided by the statute whereby the water or canal company may apply to have a new rate established at any time they deem the old rate insufficient, the canal or water company is relegated to such remedy, and, after having a new rate fixed by the board set aside on the ground that it is too low and unreasonable, it may not establish its own water rate to be charged consumers, but must go to the board of commissioners to have its petition again considered and a reasonable rate established. *Green v. Jones*. Supreme Court of Idaho. 126 Pacific 1051.

HAULING WITH A TRACTOR.

By Raymond Olney.

The tractor has proved itself a strong competitor of the horse for hauling purposes. In most every respect it has established its superiority over animal power as a means of road transportation.

In many sections of the country road conditions have made hauling with horse power next to impossible. Especially is this true in mountainous regions where the grades are very steep and rough. Here the tractor is found to be a very reliable and economical source of power, and in fact it is the only kind which can be used successfully on account of the severe service which has to be met.

While the horse has a reserve power equal to four or five times its normal capacity, still this reserve power cannot be called upon too often, as is the case for heavy hauling, particularly where the topography of the country is inclined to be hilly.



Rumely Oil Pull Tractor, Type "E," hauling 22½ yards of crushed rock—Five Troy Dump Wagons—Kouts, Indiana.

Considerable discretion is necessary in loading horses or mules for long hauls.

A traction engine manufacturer recommends that his engine has a certain rated horsepower capacity. As long as it is kept in good working condition it will maintain this capacity continuously without regard to the length of the day or the severity of the work. The horse, on the other hand, is good for only a few hours. Particularly when it is exerting an overload capacity, it soon uses up its reserve power and must necessarily be stopped to rest and store up a supply of energy. Horses also lose much time in hauling as they must be stopped frequently in order to get their breath and keep from being too quickly fatigued.

Hauling with horses requires either a number of separate teams and wagons or one large team to haul a train of wagons. Of the two the former is the best and the most economical. But one man is required to handle each team. In the case of the latter large teams are awkward and unmanageable to a very great degree and they are also decidedly inefficient.

But with a tractor the power is concentrated in a single unit, which one man will handle as easily as a team. This means in the first place a big saving in labor. Then again, a long train of wagons could be hauled behind the engine, and a large quantity is moved at one time.

Comparing the steam and the internal-combustion tractor for hauling purposes the latter outclasses the former in almost every respect. On long

hauls extra teams are required for hauling water and fuel for the steamer, whereas in the case of an internal-combustion engine a tank containing fuel and supplies may be hauled along with the outfit and no teams are needed to do this work. It is also not necessary to make frequent stops for replenishing fuel or water.

A tractor that has proved itself particularly well adapted for heavy hauling and mountain climbing is the Rumely Oil Pull Tractor, manufactured by the M. Rumely Company, La Porte, Indiana. This tractor burns kerosene and other cheaper petroleum distillates under all loads and under all conditions of climate and altitude, and at a very low fuel cost. It possesses a large overload capacity which makes it especially desirable for heavy hauling where reserve power is frequently needed.

An excellent example of the advantage of a tractor for hauling is shown by a long haul made from Rock Springs to Atlantic City, Wyoming, by means of an Oil Pull Tractor and over a rough mountainous road. The total trip both ways covered a distance of 97 miles and was made in spite of the worst conditions imaginable. During part of the trip it was necessary for the engine to break its own way.

The load consisted of one big wagon carrying 23,000 pounds of hard lumber, nails, and a steam pump equipment, a smaller wagon carrying oil, supplies, and a living outfit for the crew. This made a very big load for the tractor, but the men in charge were anxious to see it put through the hardest kind of a test.

During the trip the outfit encountered some fine, creepy sand in which the truck wheels would sink over 4 or 5 inches and in some places it was necessary to get out by means of a cable.

In crossing the Continental Divide the grade was so steep in places that it was necessary for an attendant to hold his hands over the openings in the top of the carburetor to keep the fuel from running out.

Those who watched this trip pronounced it an



Rumely Oil Pull Tractor, Type "E," used for hauling by a mining company in Colorado.

exceptional performance. Other tractors have been tried out over this same route and have fallen down because of the fact that they were unable to accomplish the requirements for this severe haul.

For road building this same make of tractor has proved very satisfactory and has many advantages for this work over horse-power. At Amarillo,

(Continued on page 165)

Reclamation Notes

CALIFORNIA.

An irrigation project, embracing thousands of acres of rich soil in and around the town of Brentwood has been inaugurated by the Balfour-Guthrie Company of San Francisco and London, England. This company recently purchased 12,000 acres and has instituted one of the most complete irrigation systems in the west. Water for irrigation purposes will be taken from Indian Creek.

Work on the construction of a dam to form a reservoir that will furnish 500,000 miners' inches of water for irrigation purposes will be commenced early this spring. About \$250,000 will be required to build the dam alone. The dam will be built at Becker's Ford, about two miles from Somerset, and will impound the waters of the Middle Fork and Cosumnes rivers. It is intended to furnish water for irrigation to the farmers of Sacramento, Amador and El Dorado counties.

At a recent meeting held at Waterford, fourteen miles west of Modesto, it was decided that preliminary plans should be made at once for the formation of an irrigation district to water approximately 20,000 acres of land. The proposed new district borders the Modesto irrigation district on the east and contains land that will be highly productive under irrigation.

Articles of incorporation have been filed by the

Graham Mutual Water Company, with capitalization of \$750,000. Principal office of the company is located in Los Angeles. Among those interested in the project are Benj. F. Graham, Donald Barber, J. A. Phillips, F. H. Edwards, and J. M. O'Brien, all of Los Angeles, Cal.

A concern known as the Miramonte Apple Land Company of Los Angeles, has purchased a large tract of apple land in the mountains near Squaw Valley. The company has filed articles of incorporation, with a capital stock of \$100,000. The object of the incorporation is to reclaim many acres of mountain land which is known to be suitable for raising fine apples.

T. G. Patton, of Placerville; O. Scribner, of San Francisco, and Senator C. B. Mills, of Sacramento, have completed plans for a great irrigation project. They have laid out a system of reservoir sites. The cost of the project is approximately \$10,000,000.

COLORADO.

The Secretary of the Interior has authorized the Reclamation Service to approve contract for the purchase of the irrigation system of the Eckerly Canal Company in connection with the Uncompahgre Valley irrigation project. This is in accordance with the plan to unify, as far as possible, all the irrigation works within the limits of the Uncompahgre Valley project, and in consideration of the transfer of the works to the government the United States will give certain designated ten-acre tracts—126 in all—a credit of \$100 each on the building charges of the project.

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**The Buckeye Traction
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One of the most peculiar cases ever filed in the federal court of Pueblo, and probably the only one of the kind ever recorded in the west, was docketed early this month. It is the case of the United States of America vs. George Fincheon, who is alleged owner of 320 acres of land about ten miles southwest of Fowler. The plaintiff asks the court to set aside Fincheon's patent to the land and to revoke all mortgage, deeds of trust and conveyances, and that the land be restored to the United States government. The strange part of the case is that the plaintiff cites no cause for the action and does not say why the defendant should relinquish his right to the land. It is presumed that the government has found some flaw in Fincheon's final proof papers, on which he secured a patent to the land.

The Henrylyn irrigation district has obtained a permit to dig its tunnel through the divide, which will bring from the western slope 119,000 acre feet of water for irrigating 90,000 acres of land north of Denver.

The Denver Reservoir Irrigation Company of Denver has announced that a French bank will furnish \$1,000,000 to refinance the company, which will open the way for settlement for 150,000 acres within thirty miles of Denver.

Since January 1 the Henry L. Doherty Company of New York City, has announced the completion of the Nile irrigation system, costing \$700,000 and irrigating 27,000 acres of land near Fort Morgan; the financing of the Antero system, costing \$3,000,000, which will be completed by June 15, and will irrigate 60,000 acres of land, all within

25 miles of Denver; the purchase of the Redlands project, which irrigates 7,000 acres of land near Grand Junction and the possible financing of the Dolores project which will irrigate 260,000 acres of land in southwestern Colorado.

UTAH.

Representatives of the Buckhorn Irrigation Company, which is reclaiming a tract of Carey act land in Emery county, appeared before the state land board recently and reported progress on the company's project, as is required by the law. The board was assured that the entire tract of 12,000 acres will be reclaimed and disposed of to settlers within a year. The company is thoroughly financed, it was reported, and is ready to carry on its work on a large scale and without delay.

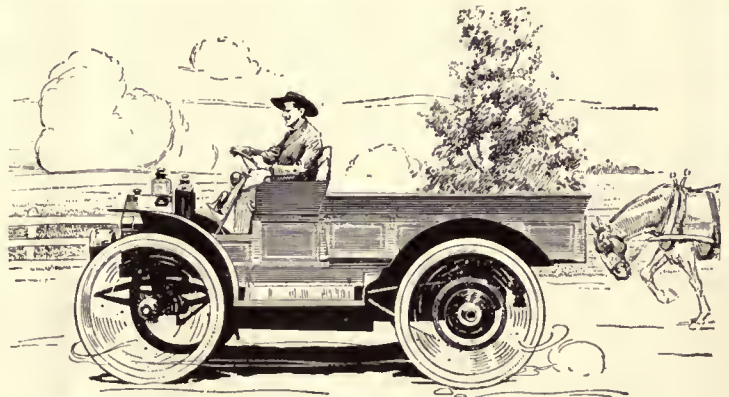
About 15,000 acres of land will be placed under irrigation by the Provo Reservoir and Utah Lake Irrigation Companies this year. About 10,000 of this will be on the east side of the Jordan river in the northern part of Utah county, and the rest will be on the west side under the Utah Lake Irrigation Company. On the west side of the river a long tunnel is almost completed to the border of Salt Lake county, which will carry water from Utah lake to a large section of land to be placed under irrigation on the west side of the Jordan river in Salt Lake county. This tunnel is nearly a mile in length and is cemented all the way.

WASHINGTON.

A. L. White, of Spokane, who owns 480 acres of land on Gravel Flat, four miles northeast of (Continued on page 160)

Only Half an Hour From Town

MODERN business men and farmers have ceased to measure distances by miles. Minutes serve instead. "We are just half an hour from town," says a farmer who lives seven miles out and owns an International car. "I went to town today, starting half an hour after my neighbor went by my gate with his team, and I passed him just where the main street paving begins. We visit every friend within thirty miles, hear lectures, see entertainments, have a better time in every way since I bought an



International Commercial Car"

An Ohio business man says: "When I am using my International Commercial Car the expense is about the same as with a team, but when it is not in use it is not eating, and, therefore, costs nothing. After a year's experience, I find the repair bills to be no more than the bills for shoeing, harness repairs, wagon repairs, painting, etc., and there is the added advantage of getting around three times as fast."

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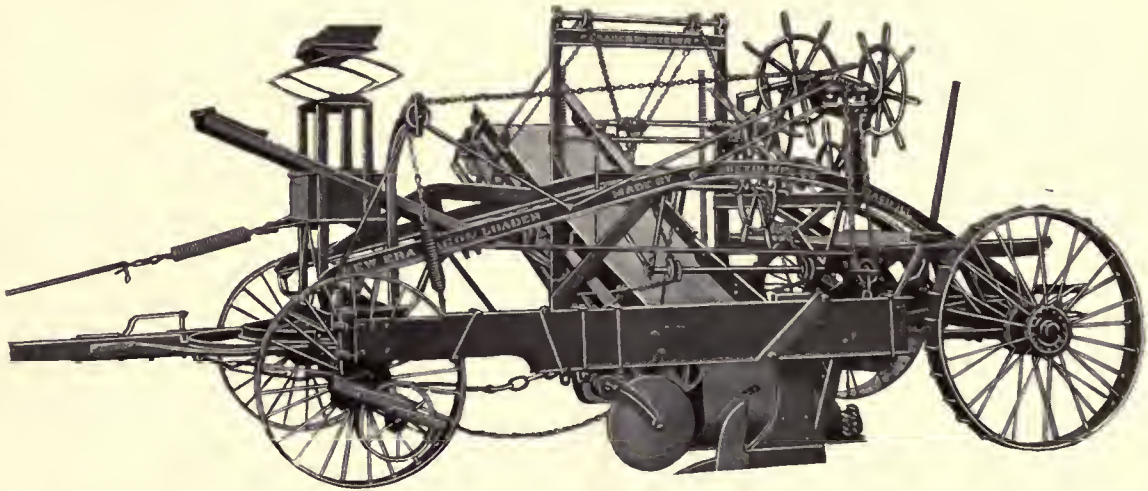
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CHICAGO U S A

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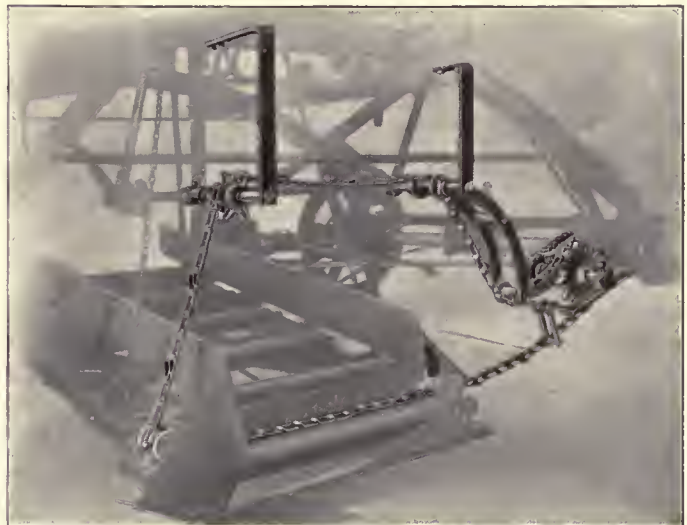
for over fifty years the leader and pioneer for economical earth handling, has advanced still higher in the estimation of practical earth handling contractors by its recent improvements.

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3. The Austin automatic sand pan cleaner.

The Austin Automatic Sand Pan Cleaner has solved the trouble and saved the delay and wear from adhering earth in the sand pan.

Our illustration explains its simplicity and effectiveness.

This feature consists of an endless sprocket chain provided with scrapers, the same traveling slowly from end to end of the sand pan over suitable sprocket wheels, shafts and idlers; the chain being driven from a sprocket attached to the rear axle of the machine. (It will be seen that the chain traveling through this space not only prevents the earth from packing but that the scrapers on the chain remove it.)



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(Continued from page 158)

Coulee City, has completed a well 347 feet deep, at which point an abundant flow of water was encountered. A pumping plant will be installed to raise water to irrigate his land.

By an agreement recently made between the attorneys for the Klickitat Irrigation and Power Company and the Northwest Electric Company, the water of the Klickitat river is saved for irrigating a large tract of land in Yakima, Benton and Klickitat counties, known as Horse Heaven. This tract, which comprises nearly a half million acres of land, is pronounced by experts to be the finest body of semi-arid land in the entire northwest. The Klickitat I. & P. Company has spent much time and large sums of money on their plans to bring the water of the Klickitat river from the foothills of Mount Adams to the Horse Heaven country. The preliminary work has been completed and it seemed that all was ready to go forward with the undertaking. Recently it developed that the Northwest Electric Company had laid claims to the Klickitat river, proposing to generate electricity which was to be used in Portland, Oregon. Since the irrigation company has filed on the waters of both the Klickitat and

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Irrigation Engineering, Herbert M. Wilson.....	4.00
The Primer of Irrigation, Anderson.....	2.00
Irrigation and Drainage, F. H. King.....	1.50
Irrigation for Farm and Garden, Stewart.....	1.00
Irrigating the Farm, Wilcox.....	2.00
Practical Irrigation, Aug. J. Bowie.....	3.00
Practical Design of Irrigation Works, W. G. Bligh	6.00
Irrigation (as a branch of engineering), Hanbury	
Brown	5.00
Earth Slopes, Retaining Walls and Dams, Chas.	
Prelini	2.00
Road Preservation and Dust Prevention, Wm. P.	
Judson	1.50
Practical Farm Drainage, Chas. G. Elliott.....	1.50
Drainage for Profit and Health, Waring.....	1.00
Farm Drainage, French.....	1.00
Land Drainage, Miles.....	1.00
Tile Drainage, Chamberlain.....	.40
Cement Pipe & Tile, Hanson.....	1.00
Arid Agriculture, B. C. Buffum.....	1.50

The Irrigation Age Company,

30 N. Dearborn St., Chicago, Ill.

White Salmon rivers, and since the electric company claimed rights on both of these streams, a compromise was effected whereby the irrigation company relinquished all claims to the waters of the Salmon river, and the electric company relinquished its claims to the waters of the Klickitat river.

For the purpose of saving the waters of the Wenatchee watershed for the Quincy Valley, \$40,000,000 irrigation project, the senate recently passed a bill reserving them for that purpose.

MISCELLANEOUS.

Messrs. Ed Singley and Frank Hudson are constructing a dam across the Clear Fork of the Brazos river, four and a half miles south of Rotan, Texas, to impound water with which to irrigate their farms.

New Orleans, La., advices state that one of the greatest undertakings of the rice industry of that state is the planting of 10,000 acres by the Shell Irrigation Canal Company of Washington, La. The canal company is building an irrigation ditch at a cost of \$500,000, which, when completed, will measure 25 miles in length.

The opening of the Gem tract of land, sixteen miles west of Caldwell, Idaho, is expected to prove one of the most important developments of the year among the state's irrigation projects. Practically all of the land in the tract has been sold and water will be turned on at the earliest possible moment. The water used for the farms will be pumped from the Snake river, and the canal system is said to be very complete.

The people of Canyon City, Oregon, and vicinity are fostering an irrigation project to put water on a tract of 20,000 acres of fertile land lying west of that city. The water supply is to be taken from Upper Canyon creek.

A bill providing for the creation of a State Reclamation Service, and a bond issue of \$20,000,000 to reclaim arid and semi-arid land, has been introduced in the Arizona legislature by Senator C. B. Wood. Primarily, it is stated, the measure had been introduced for the purpose of providing an irrigation system for the Colorado River Indian Reservation at Parker, Arizona, and if it succeeds in passing this project will undoubtedly be the first to be undertaken by the state.

The Pierre Valley Irrigation company, with headquarters at Fort Pierre, S. D., has filed articles of incorporation. The company is capitalized at \$5,000. The incorporators are J. H. Johnson, H. B. Carnacy and L. B. Johnson, all of Fort Pierre.

Judge H. C. Bartow of Presho, S. D., and G. G. Inman of Kadoka, S. D., are promoting an irrigation project which, if carried through, will reclaim 8,000,000 acres of land in their state. It is proposed to dam the Missouri river near Ft. Buford and carry the flood waters through a pipe 12 feet in diameter to Chamberlain to again be emptied into the Missouri. The estimated cost of building the pipe line is \$80,000,000, and those who are backing the enterprise are confident that the government will make such an appropriation in view of the large amount of land to be irrigated.

(Continued on page 163)

READY NOW: THE PRIMER OF HYDRAULICS.

By Frederick A. Smith, C. E., Hydraulic Engineer.

This new book is a splendid volume of over 200 pages of absolutely new matter pertaining to the subject of Hydraulics and its allied branches. All the subjects treated of are handled in a simple and practical way to make them of use to the men who have been unable to obtain a college education, but who are successful practical men in fields where they require a knowledge of the principles of Hydraulics and instructions how to solve their problems in a simple and satisfactory way. This book is indispensable for anyone engaged in works relating to Hydraulics, Irrigation or Drainage; it is primarily designed for the practical man in the field, but will be equally welcome to the trained Hydraulic Municipal and Railroad Engineer especially, on account of the many valuable tables compiled by the author, which will save a tremendous amount of time in computations.

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Article	VII. The Principles of Mechanical Forces.
Article	VIII. The Three States of Matter.
Article	IX. General Hydraulic Principles.
Article	X. The Coefficient of Roughness.
Article	XI. How to calculate n .
Article	XII. Explanation of the "C" Tables.
Article	XIII. Open Channels—Problems.
Article	XIV. Closed Channels—Problems.
Article	XV. Pipes Flowing Full Under Pressure.
Article	XVI. Loss of Head by Enlargement of Channel.
Article	XVII. Subdivisions of Channels.
Article	XVIII. Loss of Head at Entrance to Pipes.
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Tables.

Fourteen tables giving the factor C for all cases of channels for a coefficient of roughness; n varying from .008 to .050, inclusive, for channels having a hydraulic radius from .01 ft. to 900.0 and for slopes varying from 0.1 to .000025, thus practically covering every possible condition.

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 Table of Weights of a Cubic Foot of Various Substances.
 Conversion Table of United States and Metric Measures and Weights.
 Table of Squares, Cubes, Square Roots and Cube Roots.
 Table of Logarithms.
 Table of Natural Sines and Cosines.
 Table of Natural Tangents and Cotangents.
 Conversion Table, millions of gallons in 24 hours in other units.

Table of sizes of pipes or cylindrical conduits required for the flow of given quantities of water at given velocities.

Most all of these tables have been originated and computed by the author and have been checked in practical work and found to be correct, so that the tables alone will be worth many times the cost of the book.

The price of the book has been placed as low as is consistent with the superior quality of the work and it may be obtained on the following terms: \$2.50 a single copy, cloth bound; if order is sent with a new subscription to IRRIGATION AGE or a renewal subscription, the book will be sent and THE IRRIGATION AGE one year for the sum of \$3.00.

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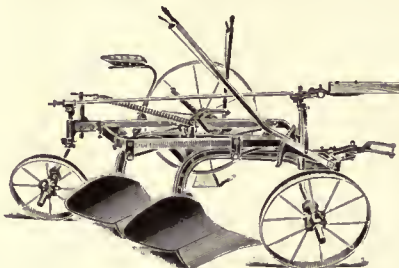
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Are you sending irrigation water through dirt ditches? If so, half of it is seeping down through the sand, and **your money is going with it.**

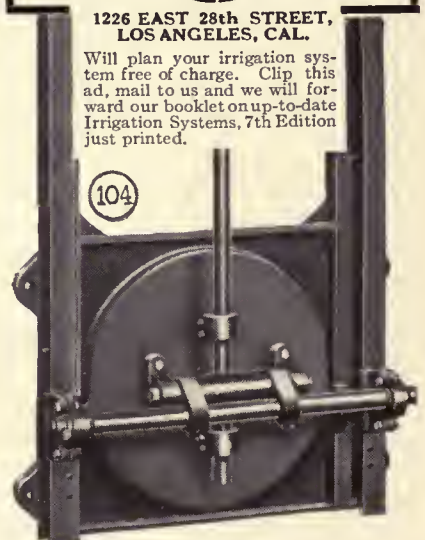
We are the originators of the scientific irrigation system. Our Gates and Valves are the product of many years' investigation, study and improvement—the best in the world.

Install our economical irrigation system as others are doing—and do it before you lose in the race for dollars through wasteful methods and keen competition. The

KELLAR-THOMASON CO.

1226 EAST 28th STREET,
LOS ANGELES, CAL.

Will plan your irrigation system free of charge. Clip this ad, mail to us and we will forward our booklet on up-to-date Irrigation Systems, 7th Edition just printed.



(Continued from page 161)

The Independence Irrigation Company of Rawlins, Wyoming, has filed articles of incorporation and has taken over and will complete the Oregon Basin project in Park county, under which it is proposed to reclaim 300,000 acres with water from the Shoshone river. The new corporation, which is financed by Chicago capitalists, will succeed the Oregon Basin Irrigation company, which failed after spending \$450,000 on the project. The new company is capitalized at \$4,000,000, and they state that the project will be rushed to completion.

The Valier irrigation project in Teton county, Montana, which was commenced in 1908, will be completed by June 1 of this year. The project when completed will irrigate 118,000 acres of land, and has been constructed at a cost of about \$4,000,000.

Hundreds of pure-bred cows will be shipped to the state of Idaho from the dairy sections of the middle west to be scattered among the farmers on the tracts of the Idaho Irrigation company. The corporation has loaned farmers on its tract \$50,000 for the purchase of fine dairy cattle in order to build up the industry and to create a demand for the thousands of tons of alfalfa that are raised on the tract every year.

The United States will be asked to bring the Panama canal equipment from the isthmus, when the ditch is finished, to dig a 1,000-mile irrigation ditch through western Nebraska and Kansas. J. C. Hopper, of Ness, who is a prominent land owner and banker, heads the movement, and Congressman Neeley has introduced a bill asking for \$50,000 to investigate the feasibility of the plan. The plan is to dig a canal from the Black Hills to the Cimarron river in Oklahoma, crossing Ford county, east of Dodge. A system of storage basins and laterals would send the waters that now inundate the Missouri valley each spring through sections that need irrigation.

(Continued from page 148)

bered that the average equity in real estate mortgages is around 33 1/3 per cent, the margin of safety in this instance may be more thoroughly appreciated.

The foregoing is believed to be a conservative presentation of the present status of irrigation as a going proposition. Deductions made, as to their bearing on the value of irrigation securities, are believed to be well within the bounds of reason.

Mayer HONORBILT SHOES



Made of specially selected upper leather and well seasoned soles. Durable, tough, pliable. Treated by special process to keep out water and moisture. For dress-up occasion wear Mayer Honorbilt fine shoes.

Sold by leading dealers. If your dealer will not supply you, write us.

F. MAYER BOOT & SHOE CO., Milwaukee, Wis.



THE ARROWHEAD

A monthly magazine of
Western travel and development

Contains useful and instructive information to anyone contemplating a home in the West.



Subscription price,
\$1 a year.



Six months, 75 cents

PUBLISHED BY
The Industrial Department

San Pedro, Los Angeles & Salt Lake R. R.
(Salt Lake Route)

LOS ANGELES, CAL.

At Last! We Have IT. Machine-Made combination LOCK SEAM and RIVETED Pipe.

Slightly tapered for slip joint. Galvanized and Black coated. In Sizes 4"-6"-8"-10"-12" and 14" diameters. Standard length 10 feet. 20 foot lengths supplied. Round and uniform in size. Furnished in No. 16 U. S. Standard gauge and lighter. Irrigation, Dredging and Pressure Pipe riveted on 1" centers, with application of red lead on lock seam before grooving and riveting to insure high pressure without leak. Ventilation and Blow Pipe, riveted 2" and 4" centers. Our special process for seaming and riveting does not disturb the galvanized coating. We quote special prices on riveted pipe made from Rust Resisting Iron (not steel) good for 20 years and longer without a leak.



We successfully compete with all other makes of Pipe. BUY THE BEST. Write for Price-List and Discount.
ROBERTSON BROS. MFG. CO., 1036-46 West 37th St., Chicago, Illinois.

When writing to advertisers please mention The Irrigation Age.

Fairbanks-Morse Pumping Outfits



2 H. P. Gasoline Engine belted to Centrifugal Pump lifting 120 gallons per minute. 12 to 15 ft. lift.

Oil and Gasoline Engines Electric Motors & Generators

*Pumps of all kinds, Centrifugal
Plunger, Duplex*

1,000 to 400,000 GALS. PER HOUR

Direct connected Belt Drive, Electric Drive; Engine and Pump mounted on same base, if desired.

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Fairbanks, Morse & Co.

900 S. WABASH AVENUE

CHICAGO, ILL.

Use KEROSENE Engine Free!

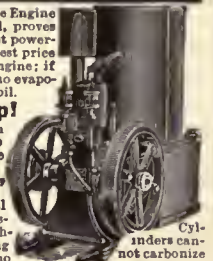
Amazing "DETROIT" Kerosene Engine shipped on 15 days' FREE Trial, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing. No waste, no evaporation, no explosion from coal oil.

Gasoline Going Up!

Gasoline is 9c to 15c higher than coal oil. Still going up. Two pints of coal oil do work of three pints gasoline.

Amazing "DETROIT"

—only engine running on coal oil successfully, uses alcohol, gasoline and benzine, too. Starts without cranking. Only three moving parts—no cams—no sprockets—no gears—no valves—the utmost in simplicity, power and strength. Mounted on skids. All sizes, 2 to 20 h. p., in stock ready to ship. Engine tested before crating. Comes all ready to run. Pumps, saws, threshes, churns, separates milk, grinds feed, shells corn, runs home electric lighting plant. Prices (stripped), \$29.50 up. Sent any place on 15 days' Free Trial. Don't buy an engine till you investigate the money-saving, power-saving "DETROIT." Thousands in use. Costs only postal to find out. If you are first in your neighborhood to write, you get Special Extra-Low Introductory price. Write! (138)
Detroit Engine Works, 301 Bellevue Ave., Detroit, Mich.



GALVANIZED METAL IRRIGATION FLUME

(Newcomb Patent)

Made entirely of rust-proof, galvanized iron. No bolts or rivets used in construction. This flume is considered by experts to be the most serviceable equipment for the purpose on the market. A careful examination of the construction as shown herewith will convince those who are acquainted with irrigation conditions of its lasting quality and the ease with which it may be put together. Complete information, with prices, will be furnished on application to the



Section of Flume

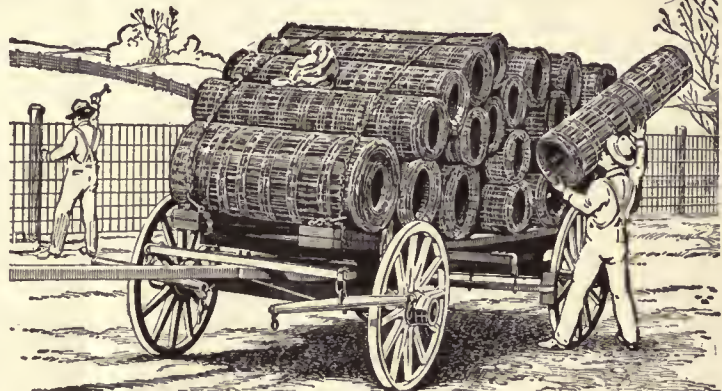
KLAUER MFG. COMPANY, Dubuque, Iowa

IHC Wagon Quality Shows in Service

WE could sell wagons for less money, but we don't care to sell that kind of wagon. We want your second order, and your third, and every order you give for a wagon. We can't be sure of getting those orders unless the first wagon you buy from us proves so satisfactory that you would not think of going anywhere else for the second. We have to tell you how good our wagons are to get your first order. After that, we expect the wagon itself to do the selling. I H C wagons

Weber New Bettendorf Columbus Steel King

are made of selected, high-grade material throughout. The lumber is air-dried—seasoned out of doors—for three years or more before it is used. Do you know the difference between air-dried and kiln-dried wood? One process takes years of time, and leaves the fibres of the wood filled with and cemented together by the natural resinous residue of the sap. The other requires only a few days' time, drives out all the sap, resin and all, and leaves the wood brittle and weak. Air drying produces elastic lumber, wagon parts that bend and give under



loads and strains, but that come back to their original position when the strain is removed.

Weber and Columbus wagons have wood gears; New Bettendorf and Steel King have steel gears. The I H C local dealer knows which wagon is best suited to your work, and will give you catalogues and full information about the wagon he sells. See him, or, if you the nearest branch house.

WESTERN BRANCH HOUSES: Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

International Harvester Company of America
(Incorporated)

Chicago

U S A



(Continued from page 156)

Texas, it was used for hauling gravel from a pit to a distance of six miles where roads were being built. For this job a 25-45 h. p. Oil Pull Tractor hauled eight dump wagons at each trip loaded with three yards of gravel. One yard of gravel weighed 3,000 pounds, and each wagon weighed 4,000 pounds empty. The total weight of the load of wagons and gravel was 52 tons. The engine pulled it with no difficulty whatever.

A 15-30 h. p. tractor was also used on this work and hauled five wagons with ease, or a total load of about 32½ tons.

A tractor for hauling is particularly an advantage for the grain farmers. Instead of a large number of separate trips to the elevator or storage bins, as would be necessary if horses were used, a carload or more can be hauled at one trip by means of a train of wagons and engine. This greatly facilitates the market problem, which many find it so difficult to solve, and means much to the farmer who is at a considerable distance from a shipping point.

(Continued from page 149)

ment Association; President Idaho Children's Home Finding and Aid Society; Honorary Vice-President Panama-Pacific Exposition; Chairman Advisory Board National Council Women Voters; Honorary member Grand Army Republic, Department of Idaho, and Honorary member Kansas Historical Society. He is a member of the Woodmen of the World, an Odd Fellow, a Mason, an Elk, an Eagle, and a member of the Congregational Church. He has two sons, James Robb and Silas Edward Brady, the former of whom is editor and publisher of a newspaper at Caney, Kansas, and the latter in the jewelry business at El Reno, Oklahoma.

In 1911, Mr. Brady organized a party composed of the governors of the northern and northwestern states, and was director of what was known as the "Governors' Special." They visited various cities in the central and eastern states, and were entertained in the White House by President Taft.

In 1912, he was elected president of the Trans-Mississippi Commercial Congress.



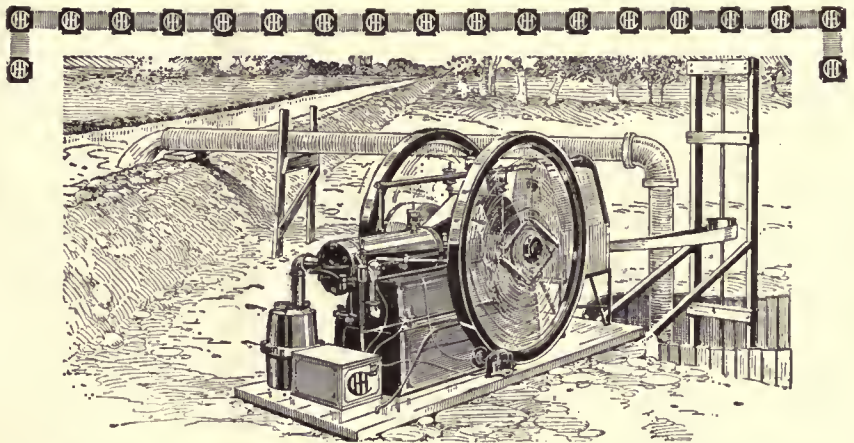
Whitman's Sultan Engine Means \$\$\$\$

to the
man that
operates
a Hay
Press.
Less ex-

penditure in upkeep. Cheaper Repair Bills; Less Breakage. When you buy a WHITMAN Steel Queen Hay Press or Alfalfa Baler you get an engine on your press that is built by the same factory that builds the press. Every experienced hay baler knows the quality of Whitman's World's Standard Baling Presses and knows when he buys a WHITMAN Press he has that guarantee for life that has made WHITMAN machines so famous in every country in the world.

Write for Hay Press Catalogue and Gasoline Engine Catalogue and secure best at start.

Whitman Agricultural Co.
St. Louis, Missouri, U. S. A.



Insure the Right Amount of Water

GROWING crops by irrigation is a success or failure according to your ability to get the correct amount of water on the ground at the right time.

One sure way to provide the right amount of water at the right time, is to install an independent irrigating plant run by an

I H C Oil and Gas Engine

An I H C engine will also furnish power to run a feed grinder, cream separator, or any other farm machine.

I H C general purpose engines are built in every approved style—vertical, horizontal, portable, skidded, and stationary, air-cooled and water-cooled; in all sizes from 1 to 50-horse power. They are equipped to run on gas, gasoline, kerosene, distillate, or alcohol, enabling you to use the fuel which is cheapest or most convenient. Tractors are made in 12, 15, 20, 25, 30, 45, and 60-horse power sizes, suitable for use on large farms or small.

There is an I H C local dealer near you who carries these engines in stock or can get one for you. Also, he will always be able to provide any necessary repair parts promptly. Get catalogues and full information from him, or, write the nearest branch house.

WESTERN BRANCH HOUSES

Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.;
Salt Lake City, Utah; San Francisco, Cal.

International Harvester Company of America
(Incorporated)

CHICAGO

U S A



Investigate the Fertile Northwest United States



A Montana man with a family of eleven children put \$2,385 in the bank, in addition to making a comfortable living, as the result of a year's work on 40 acres of irrigated land.

Minnesota, North Dakota, Idaho, Washington and Oregon farmers are also producing bountifully—these six States totaled a good big share of the country's ten billion dollar crop of last year.

You ought to look into these PROSPERITY STATES OF AMERICA and get in on next year's results. The land supply is limited—you can buy now much lower than a year from now in this territory where the growth is so rapid. Let me give you some illustrated literature. Write today.

L. J. Bricker, Gen. Immig. Agt., 244 Northern Pacific Bldg., St. Paul

Northern Pacific Ry

BOSTROM'S FARM LEVEL

has been on the market nearly 30 years and the sales get bigger every year.

We are proud of that record, and as the



BOSTROM IMPROVED



Price \$15

which has **Telescope** enabling you to read the Target over 400 yards away, is the most simple, accurate, durable and complete outfit ever made for

Irrigating, Ditching, Tile Draining, Etc.

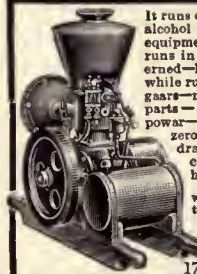
Many of the largest hardware dealers from the Atlantic to the Pacific now carry it in stock.

Write today for description of Level and we will advise name and address of nearest dealer to you and give details of our **Money Back Guarantee**.

Bostrom-Brady Manufacturing Co.

119 Madison Avenue, Atlanta, Ga.

20 Reasons Why You Should Investigate the SANDOW Kerosene Stationary ENGINE



It runs on kerosene (coal oil), gasoline, alcohol or distillate without change of equipment—starts without cranking—runs in either direction—throttle governed—hopper cooled—speed controlled while running—no cam—no valves—no gears—no sprockets—only three moving parts—portable—light weight—great power—starts easily at 40 degrees below zero—complete, ready to run—children operate them—5-year iron-clad guarantee—15-day money-back trial. Sizes 2 to 20 H. P. Send a postal today for free catalog, which shows how Sandow will be useful to you. Our special advertising proposition saves you one-half cost of first engine sold in your county. (167)

Detroit Motor Car Supply Co.
178 Canton Ave., Detroit, Mich.

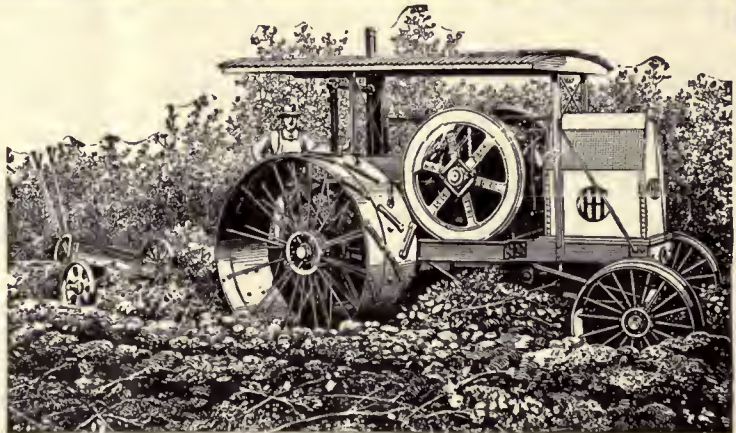
It Works Throughout the Year

EACH season brings work for an I H C tractor. On all of it the tractor makes a profit for the man who owns it. Spring plowing, harrowing, disking, and seeding are best done by I H C tractor power. Summer road making, well-drilling, grading, concrete mixing, irrigating and other pumping keep an I H C tractor busy on the days when there is no field work. Harvesting, threshing, silo filling, corn husking and shredding, wood sawing and grain hauling are part of its autumn work. Preparation of the ground for the coming year's crops keep it busy until winter's solid cold sets in.

The one thing needful to make a tractor profitable, is to have a reliable machine, so simple and easily managed that it can be handled by the regular farm help. You assure yourself of this essential feature when you buy an

IHC Kerosene-Gasoline Tractor

The men who build I H C tractors learned what was needed to make a tractor successful, by actual work in the field. Any proposed improvement must prove itself thoroughly before it finds a place in the I H C tractor. Nothing is taken for granted, nothing is slighted in their building. Therefore, when you buy an I H C tractor, you have no experiments to



make, no risks to run. Put it to work, give it reasonable care, and long before you can wear it out, it has paid for itself.

I H C tractors are made in 12, 15, 20, 25, 30, 45, and 60-horse power sizes; I H C general purpose engines in 1 to 50-horse power sizes, suitable for farm uses or for the steady grind of shop, mill and factory. The I H C local dealer will give you catalogues and full information, or, write the nearest branch house.

WESTERN BRANCH HOUSES: Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

International Harvester Company of America
Chicago U S A



What We Pay for You

By R. E. Olds, Designer

Note what we do to save cost of upkeep with users of Reo the Fifth. To save repairs and troubles. To insure you an honest car.

Cost Us \$200

These extra precautions, which some call extremes, cost us about \$200 per car. I employ them because, in years to come, they save \$500 per car.

I have proved this fact a myriad times in my 26 years of car building.

To merely sell cars, these things are unnecessary. But to hold users' good will—hold it year after year—these things must be done.

Our Extremes

Our steel is all made to formula. It is analyzed twice before using. That saves us countless mistakes.

Our gears are tested in a crushing machine to stand 75,000 pounds per tooth. Our

springs are tested for 100,000 vibrations.

Each engine is tested for 48 hours. There are five long-continued tests.

There are fully one thousand tests and inspections applied to every car.

Overcapacity

I require in each driving part an overcapacity of not less than 50 per cent.

I use oversize tires—34x4—to cut your tire upkeep in two.

I use 15 roller bearings, which cost five times what the usual ball bearings cost. And, to avoid all flaws, we use 190 drop forgings, at twice the cost of steel castings.

I use a \$75 magneto—

A doubly heated carburetor—
An expensive centrifugal pump—

14-inch brake drums—2-inch, seven-leaf springs—a 17-coated body.

And we limit our output to 50 cars daily, to insure accurate

fitting, abundant tests. To make sure that each car is right.

Does It Pay?

You know that it pays to get a car built like this if you've owned a car that wasn't. All the difference won't show at the start, of course, but in after years you'll see it.

Every dollar I spend in these extremes saves users from two to four dollars. That's why Reo the Fifth stands at the top of its class, after 60,000 of my cars have been used.

See in this car our new center control. Note the absence of levers. Both front doors are clear. Note that it has the left side drive, like the leading cars today.

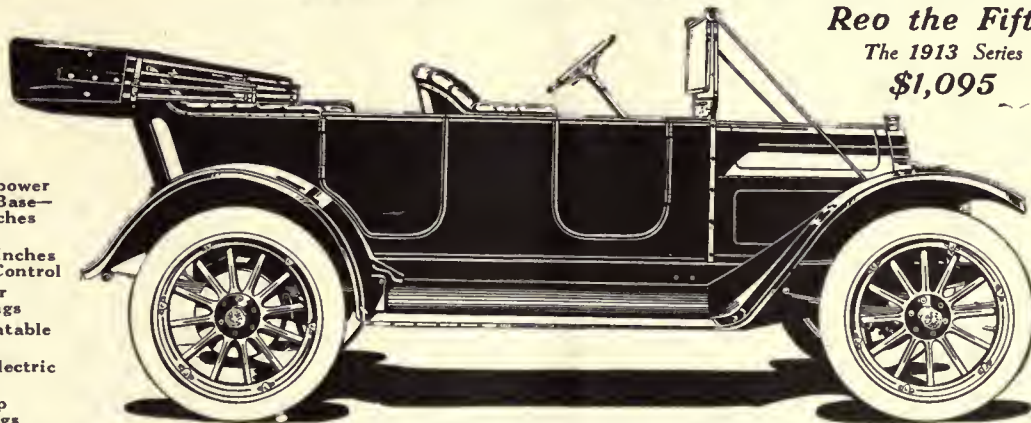
Note the flush electric dash lights. Note the splendid finish. Let our dealer point out to you the countless small perfections. This is the climax of a lifetime of effort. See what it means to you.

Write for our catalog and we will direct you to the nearest Reo showroom. They are everywhere.

R. M. OWEN & CO. General Sales Agents for **REO MOTOR CAR CO., Lansing, Mich.**
Canadian Factory, St. Catharines, Ont.

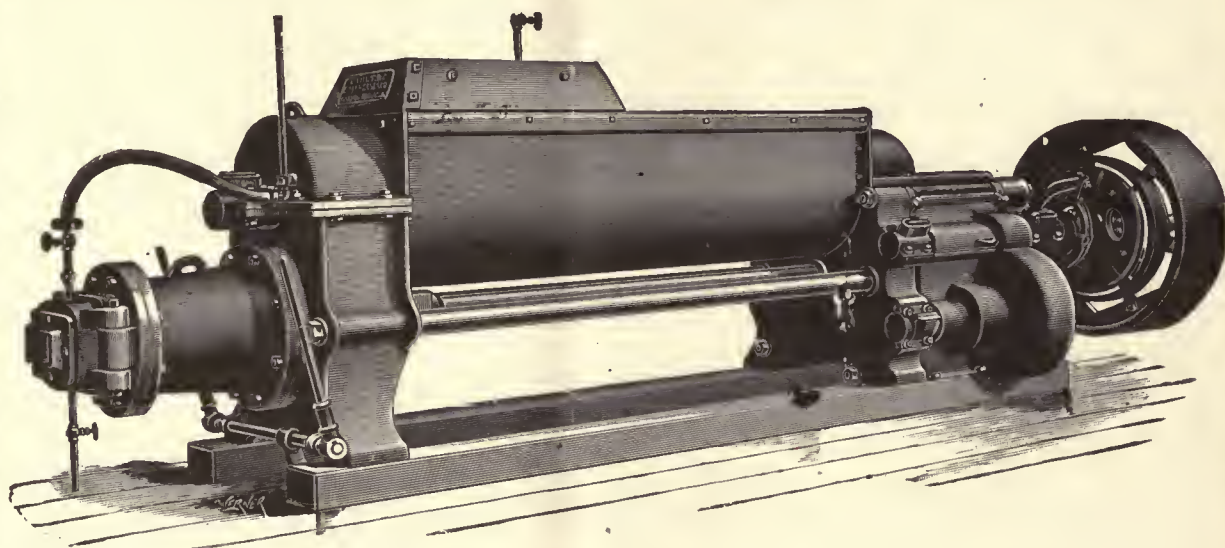
Reo the Fifth
The 1913 Series
\$1,095

30-35
Horsepower
Wheel Base—
112 Inches
Tires—
34x4 Inches
Center Control
15 Roller
Bearings
Demountable
Rims
Three electric
lights
190 Drop
Forgings
Made with
5 and 2
Passenger
Bodies



Top and windshield not included in price. We equip this car with mohair top, side curtains and slip cover. windshield, gas tank for headlights, speedometer, self-starter, extra rim and brackets—all for \$100 extra (list price \$170). Gray & Davis Electric Lighting and Starting System at an extra price, if wanted.

UNION MACHINES WITH PUG MILLS COMBINED



FIVE SIZES ALL CAPACITIES

Outfits for Drain Tile, Hollow Ware, Building
and Paving Brick and other Clay Products

If interested write us for particulars and estimates.

E. M. FREESE & CO.
GALION, OHIO

Hollow Core Wall for Hydraulic Fill Dams

In a Hydraulic Fill dam the problem of the drainage of the sluicing water is of controlling importance. The sluiced material should be such that it will not retain the sluicing water for an undue time. If the material is such that it will not deliver the water with reasonable rapidity a decided settlement with consequent cracks is bound to ensue when the fill ultimately dries out.

The sluicing water on the fill is maintained in a summit pool by hand-made levees. It is found that in depths downwards to 5', the material in suspension becomes comparatively solidified and it will then hold its shape and consistency. The sluicing water, however, must necessarily be under constant drainage if rapid construction and solid banks are expected.

A Hydraulic Fill dam during construction generally has water in the impounding reservoir above it which rises at substantially the same rate as the increasing height of the dam, but a little below its level, thereby reducing the drainage head in that direction. Assuming that there is no core wall, the sluicing water is forced to pass largely through the down stream fill unless drainage tubes in some form are provided. The passage of the drainage water through such a mass of material is slow, and hence full advantage cannot be taken of the otherwise rapid method of hydraulic construction.

Again, the material of the fill will not take its final set until the fill is complete. The fill is therefore saturated during construction, and saturated material is always of greater bulk than dry material. This fact accounts in a measure for the excessive settlement in hydraulic fills.

All this is controlled by building a Hollow Core Wall through the center of the embankment, and providing it with numerous drainage gates of simple construction. A facing of broken stone or gravel should be placed next to the upstream face of the core wall.

It is evident at a glance that with this construction we have accomplished two things:

First, we have provided an effectual water-barrier whereby when the lower prism of the dam is once drained it is forever protected against re-saturation.

Second, the problem of drainage is entirely under control and can be hastened or retarded at will. Drainage head is secured in two directions, namely, towards the core and towards the toe. The material more quickly receives its final set and unexpected settlement is thereby avoided. The time of construction is greatly hastened.

Moreover, in the usual form of construction the levees on the outside edge of the pond frequently give way and permit a localized washout on the slope of the fill. The central drainage into the Hollow Core Wall permits of instant relief of excessive water and makes a washout impossible.

Again, if the sluicing material is such that it settles rapidly, the surface water can be quickly drawn off into the Core Wall.

Once the fill is completed the drainage gates into the Core Wall from the lower prism are permanently opened. This insures an absolutely dry prism; a result never before reached.

The above is a mere outline of the functions of the Hollow Core Wall in relation particularly to the Hydraulic Fill during construction. The advantages named in a previous advertisement in connection with an ordinary rolled earth dam apply in full to the Hydraulic Fill when the same is completed and in permanent service.

The above notes are fairly illustrated by the sectional drawing herewith presented which roughly represents a Hydraulic Fill Dam in process of construction. The Hollow Core Wall is carried up to and a little above the ultimate embankment and provides interior inspection through the heart of the fill.

This topic is more fully treated in our Circular on EARTH DAMS. The introduction of the Hollow Core Wall entirely changes the basic problem of an earth dam, whether of rolled earth or hydraulicked into place. These points will not admit of discussion in an advertisement.

Respectfully submitted,

AMBURSEN HYDRAULIC CONSTRUCTION CO.
ENGINEER-CONSTRUCTORS, 88 Pearl St., Boston, Mass.

All inquiries from Canada should be addressed to
Ambursen Hydraulic Construction Co.,
405 Dorchester St., West, Montreal, P. Q.



HYDRAULIC FILL DAM WITH HOLLOW CORE WALL IN PROCESS OF CONSTRUCTION

SPECIAL NOTICE

We take pleasure in announcing that we have perfected an arrangement whereby Messrs. Lewis & Wiley of Seattle, Washington, become associated with us in all work involving the sluicing of earth for the construction of dams or for any other purpose. The reputation of the above concern was made in the famous re-grade of Seattle, whereby the hills of that city were cut down and used for fill on the water front. A similar contract has been carried out by this company in Portland, Oregon, and a third one is now in progress in Seattle.

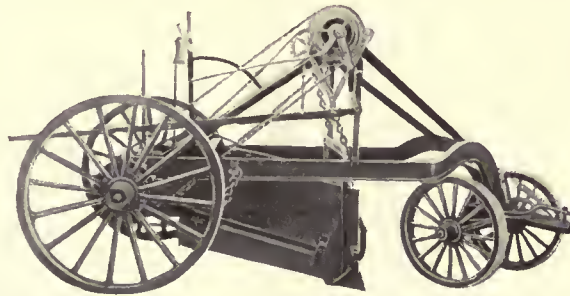
Messrs. Lewis & Wiley are undoubtedly the foremost concern in the world in this special line of work, and we deem ourselves fortunate in securing their association with us.

AMBURSEN HYDRAULIC CONSTRUCTION CO.

? WHAT WILL IT DO FOR YOU ?

The MANEY FOUR WHEEL ONE YARD CAPACITY SCRAPER ?

**Self Loading,
Self Dumping
and Spreading
Does Not Spill Load
When Hauling**



The MANEY

**Excavates, Loads,
Transports, Dumps,
Spreads, and it even
Rolls and Compacts**

**A seat is provided for driver within easy reach of operating levers
WORKS WELL IN BOTH DRY AND WET MATERIALS**

By using Maney One Yard Capacity Self Loading Scrapers you save the cost of elevating graders (and the cost of operating same) and don't have to buy extra Dump Wagons—as the Maney's actually do the work of both.

For building Irrigation Reservoirs, Dams, Levees, Canals, Ditches, Laterals.

Rough and logged-off lands are quickly leveled and graded with Maney Self-Loading, Self-Dumping and Spreading Scrapers.

The job is done at the minimum expense by using Maney Scrapers. Gets a full yard every load. Stands up to the work all the time because built and guaranteed for rough usage.

Works wherever horses, mules or tractors can go.

Use it as a Excavator, Dump Wagon, Hauling Wagon, Scraper or Leveler, without any change of hitch or mechanism. The Maney Four-Wheel Self-Loading Scraper is a simple, sensible, successful, practical economizer on reclamation and irrigation work because **IT SAVES EXPENSE OF PURCHASING AND OPERATING HIGH PRICED EXCAVATING AND HAULING MACHINERY AND DOES ITS WORK AT ABOUT THE COST OF HAULING ORDINARY SCRAPERS OR DUMP WAGONS.**

We can fill orders promptly from our factory, also from our Western and Coast distributing warehouses.

We sell on easy terms to responsible purchasers. Write us today for the Maney Money-Saving—Money-Making Proposition.

THE BAKER MFG. CO., 526 Hunter Bld., CHICAGO, U. S. A.

Tractorize Your Farm Work

TRACTORS are better than horses for the more important farm work. Plowing, harrowing, seeding, harvesting, threshing, irrigating, hauling to market, all are accomplished on time and at less expense with I H C tractors than with horses. Tractors do the work in so much less time that you can avoid unfavorable weather entirely and still finish your work in season. Also, no matter what may happen to a tractor, it is always possible to repair it and make it as good as new. Worn or broken parts can always be replaced at comparatively small expense. An I H C tractor is a necessity to economical farmers. Tractorize your farm work.

Buy An I H C Oil Tractor

I H C tractors are largely responsible for the growing general use of tractors, because they are reliable, simple, and do their work at such low cost. The average cost of plowing an acre of ground with an I H C tractor is 45 cents as against \$1.25 with horses. Costs of harrowing, harvesting, threshing, and other farm operations are reduced in about the same proportions when I H C tractors are used.

There is an I H C tractor of the right size and style for work on your farm. For small farms, the 12, 15 and 20-horse power sizes are

best. The 25, 30, 45 or 60-horse-power I H C tractors will do the work of the largest farms. They operate on low or high grade fuel oils. The I H C engine line also includes portable, skidded and stationary engines from 1 to 50-horse power, to run any farm machine. The I H C local dealer will give you catalogues and full information, or, write the nearest branch house.

WESTERN BRANCH HOUSES

Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

International Harvester Company of America

(Incorporated)

Chicago

U S A

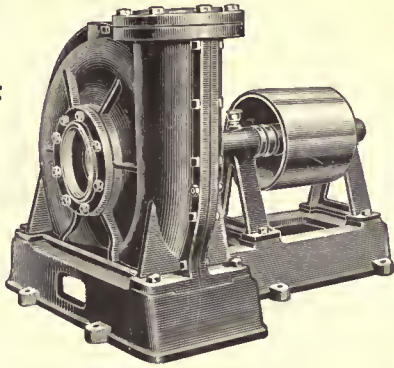


When writing to advertisers please mention The Irrigation Age.

\$39⁵⁰

For this large
270-Gallon
pump.

Other sizes in
proportion.



Without
comparison the biggest
pump value ever offered—the

“BUFFALO” CLASS M SIDE- SUCTION CENTRIFUGAL

For general drainage and irrigation purposes not exceeding 50 feet total head the Buffalo Class M Centrifugal Pumps represent the highest manufacturing achievement in producing, at a popular price, a pump of astonishing quality—low power consumption, smooth operation, extraordinary strength and freedom from repairs.

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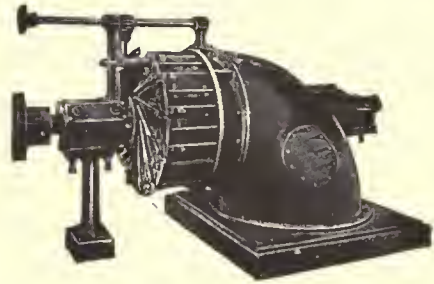
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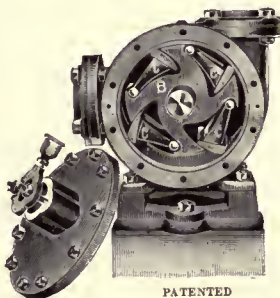
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Twenty-Eighth Year

THE IRRIGATION AGE

VOL. XXVIII

CHICAGO, APRIL, 1913.

NO. 6

THE IRRIGATION AGE

With which is Merged

The National Land and Irrigation Journal

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD
THE IRRIGATOR

D. H. ANDERSON

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D. H. ANDERSON, Editor

ANNOUNCEMENT.

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only publication in the world having an actual paid in advance
circulation among individual irrigators and large irrigation corpo-
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readers in all parts of the world. The Irrigation Age is 28 years
old and is the pioneer publication of its class in the world.

Lessons From Deep Tilling Experiments.

We are presenting in this issue a number of half-tone engravings illustrating the experiments being carried on by the Spaulding Tilling Machine Company of Cleveland, Ohio. The method, as explained in the article, shows results in the wonderful development of plant roots as a result of stirring the soil to a depth greater than that ordinarily practiced by the users of the old time plow. If one were to ask the average depth of corn roots, the reply would likely be nine to twelve inches. The description and illustrations of this experiment carried on at Cleveland shows a corn root, where the soil was stirred to the greater depth, of from four to ten feet, demonstrating clearly that corn roots will penetrate wherever possible in their search for food.

We intend to publish information concerning other experiments carried on by the company in future issues of THE IRRIGATION AGE. We have in contemplation a series of articles along this line, believing that this sort of matter will be of great benefit to the ranchmen and farmers throughout the West who are readers of this publication. If deep tilling will double or quadruple the crop of corn in the middle states, there is no reason why similar

results may not be obtained through this process in raising smaller grains throughout the arid and semi-arid regions of the West.

It is possible that this method of tilling by the methods of the Cleveland concern will revolutionize our system of agriculture in the semi-arid regions of the country, as it seems to fill the need of a sub-surface packer and plow combined.

Wonderful Market Developing in Australia.

Word comes from Australia that wonderful development is taking place there in the irrigation field. There have recently been shipped from Chicago machinery exceeding in value a half million dollars, all of which has gone into the irrigation territory of Australia.

The editor of THE IRRIGATION AGE, by a letter received from one of the officials there dated February 25, is informed that four large new machines were recently started to work there, all of which were made in the city of Chicago. These machines range in prices from \$2,500 to \$10,000. It will be seen from this that American manufacturers are opening up a fine market for high grade earth handling machines and implements in that country.

It appears that machinery made in this country is reckoned far superior to that made on the other side of the water, as it will perform work for about one-half or less than half of the cost of German or French made machinery of a similar class.

We have in mind one instance where a job of excavating was done in the state of South Australia by an American made machine at a cost of from 2 to 3 cents per yard, where the estimate cost with German or French machinery was 9 to 11 cents. This speaks very well for our home products, and manufacturers throughout the country would do well to investigate Australia and her possibility as a future market for American made machinery.

American manufacturers of farm machinery and accessory lines, including gasoline engines, carth handling machines, pumps, etc., should develop trade in Australia running up to ten or fifteen million dollars annually. The business may be had if our manufacturers will go after it.

Potato Crop in Danger.

Word comes to us from the West that the potato crop throughout the entire irrigated districts is in danger of annihilation through strange plant diseases which have developed.

This unwelcome prediction is made by no less an authority than Dr. Eugene H. Grubb, the potato expert of Carbondale, Colorado, and Twin Falls, Idaho. Dr. Grubb is author of a work known as "The Potato," which is supposed to be the best treatise ever written upon this important vegetable. Dr. Grubb has been employed by various railways to conduct experiments and further improvements in the cultivation of potatoes along their various systems in the West, and has recently been in conference with railway officials as to the best manner of combating the ravages of the plant diseases which he fears.

Speaking of the potato situation, Mr. Grubb says: "We now have an experimental farm and plant breeding station at Jerome, Idaho, and are doing our best to find out the nature of and remedy for the strange fungus growth which bids fair to ultimately destroy every potato crop in the West. This growth, and other plant diseases, have doubtless been imported from Europe, potatoes from those countries having been mixed with our purer product."

It is practically certain, Dr. Grubb adds, that the legislature of the state of Colorado will give an appropriation during the present session for the establishment of an experiment station at Greeley; but the United States Congress refuses to consider an appropriation of \$30,000 for a national campaign.

The potato crop is very important throughout

the entire West, and if its production is hampered or lessened it will materially affect every farmer in the arid sections of the United States. It cost the American people, according to Dr. Grubb, a million dollars last year for sprays and other germ-killing treatments to save the crop. Statements of this character, coming from any less authority than Dr. Grubb, would be questioned. He, however, is so well informed upon the question of potato culture that his remarks may well cause alarm.

Secretary of Interior Starts Well.

The new Secretary of the Interior, Franklin K. Lane, has already shown his ability to understand conditions throughout the West, and justifies his selection to this office by the President. One of his first moves

was to reach out and stop some of the water companies who were seeking to obtain possession of valuable development sites on the various watersheds throughout the West, particularly in Washington.

Some time ago President Taft withdrew from entry 18,000 acres of reservoir sites involved in the Washington dispute, and the state legislature reserved all water powers on the watershed in order to irrigate about 300,000 acres in the Quincy Valley. The water power companies which had filed on the government lands requested Secretary Lane to revoke the Taft withdrawal order and restore the land for entry. The request was refused. In explaining his position the Secretary says: "This action by the federal government was initiated in response to the request of citizens of Washington, and in view of the recent action of the Washington legislature, reserving all waters in the Wenatchee watershed, it illustrates the type of coöperation between nation and state necessary to promote the highest utilization and development."

Mr. Lane further informs the people who made the request that they may rest assured no revocation of this executive withdrawal will be recommended without first affording full opportunity for the presentation of the views of the people in that state, and for a complete investigation of the possible uses of the river. This is definite and clear, and the Secretary is to be congratulated upon his early grasp of this and other situations.

Secretary Lane will no doubt avail himself of the assistance of western members of both houses, who are thoroughly informed in his treatment of the western situation. In addition to this, when troublesome matters arise, a safe plan for the department to follow would be to send a special agent who understands western conditions over each field in dispute—some man who is fully qualified to

judge as to the merits of the case and whose judgment may be fully relied upon by the Secretary.

Frequently, what would appear to be an attempt to grab some particular tract of land or water power for private use would, on investigation, prove the best means of developing a territory, and increasing the production in an agricultural way throughout the particular state in which such a condition may arise. There is danger that Secretary Lane will have many advisers and callers who are willing to misinform him about situations in the West, and he will need to be on his guard. He has made a start, however, that promises well for future decisions.

May Adopt Australian System.

It is understood that there will be an effort made under this administration to shape up a colonization policy similar to or on a line with that carried on throughout Australia.

Certain officials are at present investigating the Australian system with a view to presenting it to Congress for consideration and possible adoption.

According to reliable information which we have secured from Australia, the capital necessary to establish one's self upon an irrigated farm is about \$2,000. Elsewhere in this issue will be found a letter from Mr. Thomas Bunbury, Ballendella, Victoria, Australia, in which he gives valuable information to intending settlers in that country. In view of the fact that Australia is looking for a reasonable number of settlers from America who will be able to teach irrigation to their colonists from the older countries, this letter should be gone over carefully.

We expect to publish articles regularly from the pen of Mr. Bunbury and in that way give our readers a good general idea of what a settler may do under the Australian system. Generally speaking, Australia offers better inducements to colonists than any other country. It gives a long time—about thirty years—in which to pay for the land, and the first payment required is only about three per cent of the land value, and a period of thirty to thirty-two years in which to pay the balance in annual instalments, with interest at the rate of six per cent.

Besides this, the Australian government advances money to the amount of about 60 per cent for improvements on a new homestead. That is to say, if a man, as explained by Mr. Bunbury, has \$2,000, he can invest that in farm equipment, while the government will take care of building his house and putting in his first crop. It is our impression that fifteen years is given in which to return this

loan of 60 per cent of the value of the buildings, fencing, etc. The farmer, however, is expected to pay for all of the smaller equipment, including live stock, implements, etc.

We hope to be able, in a short time, to furnish a complete description of what the Australian government will do, as we have written for this information to the colonization representative of that country, who is at present in San Francisco. Mr. Bunbury's letter will be found highly interesting and we believe will give our readers a clear idea of conditions in the "Land of the Southern Cross."

Meeting National Conservation Congress.

A meeting of the Executive Committee of the National Conservation Congress was held in Washington, March 10, to consider various matters of importance. President Charles L. Pack of Lakewood, N. J., in his address pointed out that conservation must not involve the possibility of retarding honest development upon fair terms.

In private conversation after the adjournment, Mr. Pack stated that conservation does not mean reservation; that it means the best use of our resources, with a fair regard for the present and the future. It means also progress and prosperity. He was moved to make these suggestions, he said, by the misleading rumors that were spread abroad concerning the alleged purposes and aims of the Conservation Congress.

Continuing, Mr. Pack said that conservation is in danger of "getting in bad" if the impression should prevail that the Conservation Congress stands for the closing of any avenue leading to the honest development of public or private natural resources. The kind of conservation that amounts only to reservation and disuse, he believed, would do greater harm to the present generation than it would do good to those who come after us.

President Pack's attitude is at direct variance with the close corporation methods of the Pinchot crowd, who aim to hold up all development of unoccupied territory under the pretense of benefiting future generations. It is clear to all who have studied the subject that wise conservation means development, with proper safeguards. As President Pack says, rational conservation is an economic institution which means the fullest use of the natural resources in such manner as to give the people of today their chance, while it does not deprive posterity of its chance.

If Mr. Pack will study the situation as it exists today in the West—study it on the ground—he will learn that the Pinchot plan of conservation has not aided in the development of the West, but on the

contrary has retarded progress. Complaints have come to THE IRRIGATION AGE from time to time concerning the manner in which various forest reserves are handled by the Forestry Bureau, which leaves no ground to doubt that the stand taken by the Forestry Bureau (which work was inaugurated under the Pinchot regime) has materially lessened progress in the mining fields as well as in that of stock raising.

It is the opinion of THE IRRIGATION AGE that sooner or later the control of each specific area known as forest reserve, or by whatever name designated, will be handled by local state officials who understand the situation, and are better able to cope with difficulties arising than are the bureau heads in Washington. There seems to be a set policy among a certain coterie of bureau heads in Washington to restrict development by individuals or corporations. This policy is not likely to be remedied so long as the Pinchot crowd control.

Important Decisions by Secretary Lane.

Recent decisions of Franklin K. Lane, the new Secretary of the Interior, regarding government land in the West indicate a broader policy of the Department of the Interior towards the development of the dormant resources of the West. The decisions rendered refer particularly to the state of Oregon. The important feature of these decisions is that they indicate a policy of closer coöperation with the state, and an effort to reduce friction now existing throughout the West between federal and state bureaus.

The first decision was a formal agreement for coöperation between the federal government and the state of Oregon in the investigation of irrigation and power projects. The Secretary of the Interior agrees to withdraw the necessary land and the state engineer agrees to hold the necessary water for the irrigation of projects under investigation. In the second decision the Secretary makes it clear that any project or unit may be released for construction by private capital upon the payment of the cost of preparing plans, providing each project will be carried out in harmony with the public plan for the highest utilization of the waters of the state.

It is understood that Senator Chamberlain of Oregon has been interested in these two particular affairs and has brought about a better feeling between the people of the state of Oregon and the Department of the Interior.

No department of our government has been more severely criticised or disliked than the Department of the Interior during recent years, and there is no doubt that this was largely brought about by

the fact that the secretaries either wilfully ignored information which was placed before them by people interested, or were not rightly informed by their subordinate bureau heads. Secretary Lane evidently intends to take the matter into his own hands, and we anticipate much better conditions as a result.

Twin Falls Project Sales.

Sales of 40 and 80-acre tracts, and even larger patches, in the Twin Falls project, southern Idaho, continue at a healthy rate, the land being largely, if not entirely, taken with the purpose of making actual settlement on it. This is because of its large earning power, the net cash returns to the cultivators being very heavy.

Gradually the facts concerning the productive-ness of properly irrigated lands are becoming known, and as this information spreads the demand for such lands increases. Mistakes have been made in the past, serious mistakes, which it will take a long time to overcome, but as most of the irrigation projects are now in strong, capable hands, there is little to fear in the way of backsets in the future.

This is particularly true of the Twin Falls tract, title to the land, as is generally known, being taken direct from the state under the Carey Land Act. This effectively disposes of any question of doubt concerning title, which has been a stumbling block in some irrigation projects. Then the water rights are perpetual, and the character of the men back of this part of the work, and what they have already accomplished, tends to give additional surety to the permanency of the undertaking.

It is beginning to be well understood that the man farming in the ordinary way, and dependent upon the elements, cannot compete with those who practice irrigation under favorable conditions. Not only are the crops raised on irrigated land larger, but they are more diversified, and there are no failures. The yield is certain, year after year. Reports of the extent of crops by weight and money value may seem incredible to the Eastern agriculturist, no matter how rich and well farmed his land may be, but they are all susceptible of verification. Think of growing \$480 worth of cabbage on a quarter of an acre. This has been done in the Twin Falls country. All the vegetables, grain and fruit yield well.

It is this boundless productive capacity that brings these lands into demand. The people who own them naturally want to put them in producing shape, and thus, in turn, we have a valuable object lesson for others to "go and do likewise."

BENEFITS OF DEEP TILLING

We are presenting in this issue a number of illustrations showing the benefits of deep tilling through experiments carried on by the Spalding Tilling Machine Company of Cleveland, Ohio.

Mr. Francis R. Shryack of that company made experiments to show the growth of corn roots where there is a properly pulverized seedbed of sufficient depth to permit the roots to extend downwards and secure food from the soil in its moistened condition far below the surface.



Box to the Left Contains Shallow Seed Bed with Hard Subsoil. Box to the Right Contains Deep, Thoroughly Pulverized, Well Mixed Seed Bed.

The pictures 1, 2 and 3 show the results of the experiment carried on in boxes at Cleveland.

Two boxes were constructed, each 36 inches long, 30 inches deep and 12 inches wide. In constructing these boxes a wire netting was stretched around the inside of the boxes before the sides were put in place. This netting can be seen in picture No. 2.

When the boxes were completed the one shown on the left of picture No. 1 was filled with soil to approximately eight inches from the top. This soil was then packed with sledge hammers, the purpose being to make a condition similar to the tight, compact subsoil, almost invariably found just beneath the seedbed made by an ordinary moldboard plow. Loose, well pulverized soil was then placed on top of this compact soil. A quantity of fertilizer was mixed with this top soil, making a seedbed about eight inches deep.

The box on the right was filled with the same kind of soil as the top soil in box No. 1 (shallow seedbed). However, it was not packed, but left loose and well pulverized, the entire depth of the box, making a seedbed about 26 inches deep. The same quantity of fertilizer was mixed in this soil as in box No. 1 (shallow seedbed).

Grains of corn from the same ear were planted in each box. Oats were also planted.

It should be remembered that conditions were exactly the same in each box, excepting that one

box contained a compact subsoil while the other was loose.

Picture No. 1 shows corn and oats one month after planting, and it may be noted that the oats in the box on the left (shallow seedbed) are standing perfectly erect, while the oats in box on the right are very much heavier. The difference in the corn is very apparent. The corn in the box on the left (shallow seedbed) is of a yellowish green color and the stalks are spindling and the leaves narrow. The corn in the box on the right (deep seedbed) shows a sturdy stalk and a broad leaf, deep in color, indicating a vigorous growth.

It will be noticed also that the corn in the box on the right has grown so tall in this thirty-day period that it was necessary to build a rack to protect it from the wind.

Ninety days after the planting, one side was removed from each box and by means of a hose all of the soil was washed out of the box shown at the right of picture No. 1. Picture No. 3 shows the result.

In order to show this root development, the camera was moved close to the box and, for that reason, it was impossible to take the stalks, and in making the plate the artist failed to show full length of the roots. On the right of this picture will be noticed a yard stick. Before beginning the process of washing, the stalks were tied to a stake, so that they would remain in exactly the position in which they grew.

When the soil was washed away, the roots appeared as shown in this picture. The fine hair roots shown hanging below the box were stretched out along the bottom, indicating that if the box had been twice as deep and the soil had been of the same looseness the deep roots would have gone to



Result of Shallow Seed Bed.

the bottom. As it was, these roots twined about the wire netting, so that they remained in exactly the same position as they grew in the soil.

Picture No. 2 shows the side removed from box on the left of picture No. 1 (shallow seedbed) and it will be noticed in this picture the corn stalk

tied to a stake, so that it remains in exactly the same position in which it grew. On the top of this box the top soil or shallow seedbed has been washed away and the scanty root development is shown, none of these roots penetrating the hard, compact subsoil, but spreading out on its surface, evidently reaching for some opening in the hard substance where additional food could be obtained.

There is something mysterious about the manner in which plants, through their roots, prowl about in search of food, and these pictures show this as clearly as anything that has ever been brought to our attention, and nature, in these photographs, illustrates her greatest of all lessons, the method of plant life searching for sustenance as clearly and distinctly as an animal scents the ground for its food or prey.

Mr. Shryack has performed a great service in this experiment and has demonstrated more clearly than would be possible in any other way the benefits to be derived from deep tilling; in other words, fining the soil sufficiently deep to allow the plant roots unobstructed entry into the heavily laden humus beds of the lower soils.



This Picture and Results Prove the Claims of Recognized Authorities.

It illustrates, also, that in this sort of cultivation the theory advanced and exploited by our old friend, Mr. Campbell, of holding moisture in the soil by top mulch.

Judging from these pictures, we would say that deeply cultivated soil, where the moisture is properly held in a position where it may be reached by the plant roots, may be made to produce from two to four, and possibly six times the crop volume that is possible under the ordinary system of tillage.

Experiments have recently been tried on land in the Panhandle of Texas that have clearly demonstrated the possibility of working that soil with an outfit similar to that produced by the Spalding Tilling Machine Company.

This concern has made great strides within the past year or two in introducing their machines and have now arrangements with two large manufacturing concerns who cover, one the central states,

and the other the Pacific Coast states. One of these concerns is located at Denver, Col., while the other is in Albion, Mich. The parent company, the Spalding Tilling Machine Company of Cleveland, Ohio, is at present preparing a shipment of several carloads for South Africa. A representative of British South Africa has been in this country studying machinery during the past six or eight months and has ordered for his government these machines, which will, no doubt, prove of great benefit to the farmers in that country.

Judging from the results obtained through experiments in the field and those illustrated herewith, it is reasonable to suppose that a majority of manufacturers of plows will eventually find it necessary to produce something that will till the soil deeper than is possible under the ordinary system.

The editor of THE IRRIGATION AGE contemplates a study of this subject and will, through the assistance of Mr. Shryack, present from time to time articles showing other experiments and work accomplished.

Our next article will likely treat of the experiments carried on in the Panhandle of Texas, where it has been almost impossible to raise crops, owing to the inability of the ordinary plow to get into and turn over the baked soil of that region.

THE SUCCESS OF IRRIGATION.

The remarkable strides which have been made within the past decade in the reclamation of the arid West and in the creation of a land-owning citizenship in a region which, up to that time, was considered worthless, is attracting the attention of the civilized world. During the past year, as shown by the recent official reports of the Director of the Reclamation Service, almost a procession of representatives of foreign governments and distinguished engineers and financiers passed through Washington, going to and returning from a visit to the works which are being built by the Government and by corporations.

The success attained in our arid West has stimulated other countries in which are situated similar lands naturally fertile, but unproductive because of lack of moisture.

It is curious to note that from the very countries in which irrigation has been practiced successfully for hundreds and even thousands of years these experts are coming to the United States, the latest of all countries to take up irrigation, in order to study the system which has been developed by American genius and ingenuity, and to learn the fundamentals of the effective and economic handling of such work, the standards for which have been developed by our own Government. These investigators have come not only from the Mediterranean countries, but from South Africa, Australia, India and South America. After spending days or weeks studying the system of organization, methods of construction and of cost keeping, they have reported that there is no other part of the world in which this work is being conducted on such an extensive scale or with more pronounced success.

SEED GROWING IN SOUTHERN IDAHO.

By Herbert Shearer.

During my stay in the Twin Falls country in southern Idaho, last summer, I had a good opportunity to study the growth of seed bearing plants.

In order to ascertain how well the heads fill and to test the germination and to examine the color as well as the general characteristics and finally the yield, I made another trip into the Twin Falls section last fall.

I found red clover and alsike clover in abundance. There were wonderfully great quantities of alfalfa and I found some farmers who had tried out white clover successfully for seed.

Several hundred acres of garden peas were grown last year for seed, on the contract plan, for seedsmen. The original seed was furnished by the seed distributors, and the crops were grown under their direction and supervision. At harvest time the weight of the original seed was deducted and the balance of the crop was paid for at the rate of three cents per pound for the lighter yielding varieties and two and a half cents for the kinds requiring less labor to produce.

I found sweet peas yielding a greater quantity of seed than I ever saw on sweet pea vines before. I saw carrot seed, parsnip seed, asparagus seed, and different kinds of beans and peas, all of fine color, good weight, and great germination strength. This season will find many more varieties of seeds, some of which, in all probability, will bring the growers considerable money.

I visited L. A. Snider, near Twin Falls, who has in three years developed a splendid flint corn that yields well. Last summer Mr. Snider raised five acres of garden peas that yielded at the rate of 49 bushels and 53 pounds per acre. After deducting the weight of the seed and 1 per cent for dirt, Mr. Snider's check for his five acres of peas came to \$410.88—an average of \$82.22 per acre.

P. W. Hess, one and a half miles south of Kimberly, had six acres in alsike clover. His total yield from the six acres was 61 bushels, which he sold at 14c per pound, bringing him a return of \$514.

F. A. Kennedy, who lives about three miles southeast of Kimberly, had seventeen acres in alsike clover. He threshed 156 bushels, and received \$1,311 in cash for his crop, after keeping out what he thought he would require for seed.

A. G. Schade, living two miles southeast of Kimberly, had five acres in alsike clover. His total yield was fifty bushels, and he received \$450 in cash for the seed. Mr. Schade also had five acres in white clover and blue grass mixed. He sold white clover seed enough to bring him \$150 and at that time had on hand 1,000 pounds of blue grass seed.

Six farmers near Kimberly raised garden peas. Lowest yield of the six crops was 30 bushels per acre, and the highest yield was 62 bushels. The average of the whole six being a little above forty bushels to the acre. The price received was \$1.80 per bushel.

From the Twin Falls District were names of thirty-six farmers; the average of the thirty-six was 51.76 bushels.

The average crops of thirty-five farmers in the Hanson District was 51.04. At Filer he gave me the names of twenty farmers, having an average yield of 49.76 bushels per acre.

Of all these crops the lowest was 23 bushels and the highest was 109 bushels per acre. However, I shall qualify this extremely large yield by stating that there was only three acres in the piece and the owner, Mr. D. O. Ewing, had the land well prepared, and grew the wheat more like a garden crop than a field crop. However, such a yield shows the possibilities on such rich land under irrigation, when an expert like Mr. Ewing manages the business.

Upon my return to Illinois in December I met Mr. Brown, president of the Alfred J. Brown Seed Company of Grand Rapids, Mich.

I told Mr. Brown many of the details of my M. C. Ware, near Buhl, cut 44 acres of alfalfa for seed, in the summer of 1911. After deducting the cost of the sacks, and threshing expenses, his net return for the seed was \$42 per acre.

C. F. Williams, two miles southeast of Kimberly, raised 28 acres of alsike clover last summer, which yielded 10 bushels and 18 pounds per acre. His seed check was \$2,422.50.

Mr. Breckenridge, of Twin Falls, contracted to buy alsike clover seed from about 200 acres, grown by nine different farmers. The average yield of seed for the whole nine was $8\frac{3}{4}$ bushels per acre. Mr. Breckenridge told me that the quality of seed was very satisfactory, and he considers alsike clover one of the most important crops that any farmer can grow. Mr. Breckenridge is also very enthusiastic about white clover seed.

I am indebted to Mr. Breckenridge for a great deal of information in regard to wheat. He gave me the wheat figures of 123 crops. They were taken from his books consecutively, and nothing was omitted because of the small quantity or small yields. There were on his books the names of thirty-two farmers in the Buhl District. The average yield from these thirty-two farmers was $55\frac{3}{4}$ bushels per acre. In January Mr. Brown met by appointment H. L. Hollister in his office in Chicago, when I laid before them samples of seeds and grains gathered while in Idaho. The result of that conference was that Mr. Brown agreed to send a carload of garden pea seed to the Twin Falls country and to make contracts for the growing of about 500 acres this year. He has since increased his seed to four cars of peas, which will plant about two thousand acres.

After investigating conditions on the ground, he decided to extend his operations and has ordered a carload of beans from his California seed-breeding grounds, to be used in the same way.

The D. M. Ferry Seed Company of Detroit, Mich., are going into the growing of seed peas quite extensively in southern Idaho this year.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of THE PRIMER OF HYDRAULICS add \$2.50 to above price.

CORRESPONDENCE.

The Bungalow, Ballendella P. O.
Victoria, Australia, Feb. 13, 1913.

Editor, THE IRRIGATION AGE,
Chicago, Ill.

Dear Sir: I am obliged for your kindness in noting my remarks in the columns of your valuable journal, and I trust that any data I may send to you from this part of the world may lead to a feeling of good fellowship amongst all concerned, and be to the mutual advantage of both countries. Out here, we at present are as children compared to you, in the matter of irrigation, but we have behind us those who, so long as we display energy and resourcefulness, will not see us go to the wall through lack of assistance, and it is mainly to give your readers an idea of the general conditions and chances in this country I now write this article for your journal, and should any of your readers contemplate coming to try their luck here I think it well at the outset to state that I hold no brief for those in authority here, nor are they aware of my having written you or of my writing this. I simply intend to give the plain, unvarnished truth, which generally holds its own anywhere, but seeing that this state is advertising its facilities, I felt sure that a message from one who is upon the land and in the irrigation area of Victoria must be in a better position to state what his experience has been and what the possible prospects are. Personally, I am acquainted with the States' agent out your way, and who is advertising in your AGE, "Mr. Fricke," and I cannot but speak highly of the care and attention he bestowed upon me and mine when landing here, and upon all others in like position to mine, and the same spirit still hangs round his late position here. I am sure he will admit that although theoretically he knows this state and people from A to Z, yet he cannot speak of the land as I, in my humble way, can, having been upon it now for two years, and though I cannot assume to be, as one might say, "as yet out of the wood," still I am beginning to feel my feet and to see and become assured that in the near future I will at least be making a paying concern of my undertaking, then the rest, given health and strength, will be sure to follow. Men your way will want to know the capital necessary to make a success here, men of experience in farming and irrigation should do with less than others, but then it must be borne in mind that conditions in one country are rarely the same as another. The capital I think necessary is \$2,000 and should prove sufficient, that is, that amount in hand landing here. Of course, if one has a little more, no harm done. Personally, I took up land with less than half of that amount but I had been in this country before, though not on the land as an irrigator, and owing to circumstances over which I had no control, perhaps I became better versed in making little go further than most people, I having a large family to keep. After landing in Melbourne I attended at the lands office, saw the plans and was given my choice of securing one of the blocks up here. I arranged for my family to remain in Melbourne, and my eldest boy and self came right up here and went into tents until my house was erected. I may here state that the government assisted me largely towards the keep of my family in Melbourne during the time I was in tents, having promised same to me before coming up and they fulfilled it, upon my application. Having stated that \$2,000 would suffice for an intending settler, so with my two years' experience I make bold to give an idea how that amount might be utilized to the best advantage, basing my amounts upon the way I used my small portion, and my present position, through so doing. Therefore the following is what I consider the best way to utilize one's money, as it shows practically now what I have got together after two years, beginning as I said with only half the amount and am specifying for: Outbuildings, \$150. Stock, say twelve good cows at \$35 equals \$420; pigs, four at \$3.75 equals \$15; horses, two, one at \$125 and one at \$100 equals \$225; bull, \$30; fencing wire and posts, say \$100. Rolling stock, buggy, second-hand, \$80; spring cart, second-hand, \$45; wagon, \$50. Implements, plow, double furrow, \$45; plow, single furrow, \$19; set harness, \$20; agrader and leveler, \$6; horse hoe cultivator, \$12; swingle bars four, \$3; cream separator, hand, \$75. Sundries, harness, \$40; dairy utensils and tools, \$25; furniture ware and ironmongery, \$125; deposit on land say \$125, and possible contingencies, \$50, all giving a total of \$1,650, leaving a balance to bank of \$350 out of the sum total, \$2,000, so as to meet future rates, rents, etc. Of course, some of the things mentioned

may be got for less, but I have given the prices as near as possible with the exception of those marked x, which one could make oneself, as I did, and then all the amount quoted for fencing might not be needed, as fences might be there, etc. Still, I consider it best to be on the safe side and any careful man will put away what surplus he may gather for the future, but the things I have mentioned are necessary as a whole to make a success and cannot well be done without. So, presuming one has started as I have planned and having his twelve cows in full milk, his returns from that alone should be not less than \$15 to \$18 a week, on an average, for the year—this return should make things easy as a working basis to start. The conditions of agreement on taking land here are by no means harsh, as the improvements necessary for any man to make his place habitable are accounted for in my statement, and more than covers the government's requirements. One is required to reside eight out of the twelve months as long as he is lessee of the place. Well, anyone to succeed at all, anywhere, must of necessity do that. I fail to find anything to cavil at, in any way, unless one wants to find fault, and that can be done anywhere. The government here erects your house for you, if wanted. Say it costs \$1,000, well, they give you fifteen years to pay it off, and if you want such work done, they will plow, etc., and seed a portion of your land for you, but no man of experience in farming would get it done, as one can always do these things cheaper oneself. So, concluding a settler takes a 50-acre block at \$60 per acre, or \$3,000 for the lot, he has to pay at the rate of six per cent for thirty-one and one-half years, which amount covers the principal and interest, and pays outright for it in that period, so his total payments per annum would be: Land, \$180; house, that is, presuming he takes advantage of the government's offer to build him one, \$65; water rate, at \$1.20 per acre, \$50 on say forty out of the fifty acres, ten being unirrigable; other rates, \$10; insurance on house and outbuildings, say \$15; total, \$320 per acre, which includes everything. To meet this he has a practical certainty of at least \$15 a week coming in from his cows, which alone should leave him a balance of \$430 to provide food, etc. So now, having started the intending settler in the state of Victoria on a financially sound footing, on what should spell success, I will, Mr. Editor, close this article for this issue, having given what I consider the main principles to work upon. In my next article, with your permission, I will state what fodder, etc., it is best to start planting, and explain as near as I can how I have got along the road with but half the capital herein stated. Therefore, in concluding this, I will say, anyone that comes here, with farming experience, etc., must get on. Why? Because he is sure of getting all reasonable help from the government and their experts, and one great point to bear in mind, when one comes, is to place implicit confidence in those in authority and not to be led away by others. I say, start by trusting and the trust will be mutual—avoid pinpricking—work on broad, honest, hard working lines. We are all liable to error. Believe that any errors the heads may make will be rectified. Only let them see a man is a worker, or in other words, start to make a name and character, and that done, everything else fits in, as once the heads see and learn the above about a man I am quite confident no reasonable wishes will go unheeded, not only by the government, but by the people of the state. The climate here is considered A1, the people are grand, the soil will, with water, grow anything, and the markets that are in existence are about to be rapidly supplemented by others necessary for the growing requirements of the new settlers. Farmers and irrigators are wanted here, and will be welcomed. And finally, I can only say in closing this first article that if ever a man has made a mistake on the right side he will do so by coming here, as I speak with a keen sense of the favors that have on all sides been bestowed upon me and mine. In the meantime, until my next appears, should any of your readers wish for further particulars, if they will write to me addressed as herein, I shall be only too pleased to write and give them. I am,

Yours faithfully,

THOMAS BUNBURY.

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COUNTRY ROADS OF CONCRETE INEXPENSIVE IN FIRST COST AND MAINTENANCE.

No single factor plays such an important part in the social and business life of a community as the quality of its roads. Aside from the pleasure and convenience of travel, possible at all times over permanent roads, there is the financial phase which directly concerns the cost not only of farm produce but of city products as well. Consequently everybody wants good roads. In the matter of paying for permanent highways, a generally satisfactory agreement seems to have been reached in the proposed distribution of the cost between the nation, the state, the county and the users of the road in question. As a result, within a few years this country will take its rightful leading position among the nations of the world in the number of miles of permanent roads.

Changed Conditions Require Permanent Material.

In a way it is fortunate that the United States has been rather slow in the matter of road-making. The roads can now be built of lasting materials such as will withstand the wear of motor traffic, which is fast ruining Europe's century-old roadways. Lasting road materials are everywhere present in the form of sand and gravel from pits and stream beds and crushed rock from stone quarries. Combined with Portland cement into concrete, they form an inexpensive and permanent road surface which successfully resists the usually destructive action of automobiles.



Repair-Proof Road of Concrete—Always Usable.

Inexpensive Local Materials Often Usable.

The first consideration in the building of concrete roads is a careful study of local deposits of sand, gravel and rock (called the aggregate) to see whether they are suitable for concrete. Sand must be clean and hard and must grade uniformly in size of grain from $\frac{1}{4}$ -inch down. The same applies to gravel and crushed rock except that the largest particles commonly allowable are $1\frac{1}{4}$ inches in



Dirt Roads and Worn-Out Macadam—Often Impassable.

diameter. If local materials are usable, a considerable saving will be effected, as only cement will need be freighted. A brand of Portland cement should be chosen which is guaranteed to meet the specifications of the United States Government or those of the American Society for Testing Materials.

Mixing the Concrete and Building the Road.

It is much faster and cheaper to mix the concrete with a machine than by hand. Depending on the grading of the aggregate, the concrete is usually proportioned 1 bag of Portland cement to 2 cubic feet of sand and 4 cubic feet of screened gravel or crushed rock, or 1 of cement to 2 of sand and 3 of gravel or rock. During the grading and draining of the road the aggregate is hauled and piled at convenient points. The concrete is mixed mushy wet, is deposited to the thickness of 6 inches upon the firm old road-bed and is brought to grade and shape by means of a templet. In order to shed the water to the side-drains the surface of the concrete is given a rise or crown in the center of one one-hundredth ($1/100$) to one seventy-fifth ($1/75$) the width of the roadway. The surface is finished with a

wooden float and wire broom, by which means there is afforded perfect footing for horses. At intervals of 25 feet the road is divided into sections by narrow contraction joints extending crosswise the road and entirely through the concrete. These joints are formed by means of a thin metal or wooden cross-form or divider to which is tied a single or double thickness of tar paper with the paper face against the last laid section of roadway. After the surface of this section is finished, and while the concrete for the adjoining sections is being placed, the cord holding the paper to the cross-form is cut and the cross-form is removed. The tar paper adheres to the concrete and stays in the joint, which is reduced to the thickness of the paper by forcing against it the freshly placed concrete of the section under construction.

When the surface of the concrete has hardened enough to prevent pitting it is sprinkled with clean water and is kept moist for several days. Likewise, as soon as possible, the pavement is covered temporarily with two inches of sand or dirt from the side-road to give further aid in curing the concrete. Traffic is confined to the earthen side-roads until the concrete is about two weeks old. In the meantime shoulders of broken stone or gravel are built along both edges of the pavement. These are made three feet wide and sufficiently thick to be firm and to make it an easy matter at all times for wagon wheels to pass from the side-road onto the pavement.

The First Cost and the Real Cost of Roadways.

There are two phases of the cost of any improvement—first cost and up-keep expense. In both items the concrete road has proven less expensive than any other kind of permanent roadway. Of some three million yards of city and country concrete pavements built in recent years, the average first cost has been \$1.22 per square yard. The annual up-keep expense per mile on these roads has been almost nothing. In Bellefontaine, Ohio, concrete pavements in use 18 years have cost annually for maintenance only $\frac{1}{4}$ of one cent per square yard. Up-keep cost of Wayne County, Michigan, country concrete roads for three years has averaged but \$2.50 per mile. In 1911 the mean cost of repairing macadam roads in New York state was \$800.00 per mile—10 per cent of the first cost. If these roads had been concrete, practically all this immense expense could have been saved and used in building new roads instead of repairing old ones. With better roads will come better schools, better churches, happier homes, better business and decreased cost of living.

DIRECTIONS FOR OPERATING THE BABCOCK TEST.

The Babcock Test is a means of determining the percent of fat in milk, cream and other dairy products. The tester is a machine which separates the fat from milk by centrifugal force and brings it into the graduated neck of the milk bottle, so that the per cent of fat in the milk may be read directly. The equipment consists of the tester proper, called the centrifuge, a 17.6 c.c. pipette, milk and cream test bottles, an acid measure, a quantity of sulphuric acid, and a pair of dividers. A complete two-bottle

outfit, suitable for farm use, can be purchased for about \$4.00.

In making the test, great accuracy is required. Before taking a sample, the milk should be well mixed by shaking. If the milk is cold, it should be warmed in water heated to about 110 degrees Fahr., then shaken thoroughly or poured back and forth from one bottle to another, so that butter fat may be thoroughly mixed with the milk. The 17.6 c.c. pipette should be inserted immediately and the milk sucked to a little above the mark on the neck of the pipette. The right forefinger can be placed quickly over the top of the pipette to hold the milk. If the finger is dry, the pressure may be released to allow the milk to run down until even with the mark. The milk should then be transferred without loss to the milk bottle. This can be done most easily by holding the bottle in an inclined position and allowing the milk to run down the side of the bottle neck.

Sulphuric acid of specific gravity of 1.82 to 1.83 should be added. The amount to use is 17.5 c.c. The acid measure is marked to indicate that amount. If too little acid is used or the acid is too weak, the casein will not be all dissolved, and the test will be spoiled. If the acid is too strong or too much is used, the casein will be burned and black charred substances will intermix with the fat. In adding the acid, the test bottle should be held in an inclined position and the acid allowed to run down the side of the bottle. The acid, being heavier than milk, goes to the bottom and forces the milk up. Shake the bottle immediately with a rotary motion until the acid and milk are thoroughly mixed. The action of the acid is to dissolve the solids-not-fat in the milk. The chemical action causes the mixture to become very hot and almost black in color.

While still hot, the bottles should be placed in the centrifuge and whirled at the proper speed. Different machines require different speeds, and one should follow the directions that accompany the outfit. The required speed may vary from 800 to 1,200 revolutions of the wheel per minute, according to the diameter of the wheel. After whirling for five minutes, the machine should be stopped and hot water of a temperature of 140° Fahr. should be put in in sufficient quantity to bring the fat up to the neck of the bottle. Then whirl for two minutes more and add water to bring the fat all within the graduated portion of the neck. Whirl again for one minute, to make sure all the fat has come into the bottle neck and to clarify the line between the fat and the water.

The fat as it appears in the neck of the test bottle should have a yellowish or straw color, and be clearly distinct from the water below. Any black or flocculent matter in or at the edge of the fat column should not occur if the test is conducted properly.

The reading should be taken while the bottles are still hot; 125° to 140° Fahr. is the temperature at which the readings should be made. If the bottles cool before the reading is made, they should be placed in a water bath of the required temperature and then read. To read the test, the dividers are used, placing one point at the BOTTOM of the fat column and the other at the extreme TOP. Then, without changing the angle of the dividers, they are

placed with one point at the zero mark, while the other extends up along the bottle neck and indicates the percentage of fat. The milk bottles are graduated so that when 17.6 c.c. (or 18 grams) of milk are used the amount of fat may be read in direct percentage. The graduated portion is divided into ten spaces, each representing one per cent. These spaces have five divisions, each representing one-fifth, or two-tenths of one per cent.

Testing cream requires the samples to be weighed instead of measured by the pipette. This is because an accurate sample cannot be taken by the latter method. Eighteen grams of cream are required, while the 17.6 c.c. pipette holds only about 16 or 17 grams, depending on the richness of the cream in butter fat. Cream also has a tendency to stick to the sides of the pipette, which prevents an accurate sample from being taken. Special balance scales are best adapted for weighing cream samples.

In taking cream samples, the same precautions as in the case of milk should be taken to get a fair sample. Eighteen grams of cream should be weighed into each cream bottle. Usually a little less than 17.5 c.c. of acid is sufficient for cream, as there is less casein to dissolve. The mixture of acid and cream at first should have a light chocolate color, gradually changing to black as the test proceeds. The process of centrifuging and reading the test is the same as for milk, except that the fat is measured from the bottom of the fat column to the lower edge of the meniscus.

Some people prefer to use only nine grams of cream, in testing. There are special bottles made for that amount. Nine grams can be tested with the ordinary eighteen-gram cream bottle by simply multiplying the result by two to get the corrected reading. The objection to using only nine grams of cream is that in case of error the error is twice as great by the nine-gram method as where eighteen grams are used.

Testing skim milk requires a special double-necked bottle that will read a fat test as low as five-hundredths of one per cent. Ordinary separator skim milk or butter milk should contain only five to ten-hundredths of one per cent of fat, which is too low to be read accurately in the ordinary milk bottle. 17.6 c.c. of skim milk should be measured with the ordinary milk pipette and the side tube. As skim milk contains more solids-not-fat than whole milk, more than 17.6 c.c. of acid is needed; 19 to 20 c.c. is the proper amount to use. It should be added in two portions, shaking carefully after each addition to mix thoroughly without getting any solid matter into the small neck or spurting any acid on the operator. In centrifuging, the whirling should be continued for one or two minutes longer than in the case of whole milk. Usually the graduated portion of the neck is divided into five spaces, each representing five-hundredths of one per cent. The fat columns may be raised or lowered to a position to be read more easily by placing the finger over the mouth of the side tube.

Supreme Court Decisions

Irrigation Cases

PRIORITY OF APPLICATION.

Where plaintiff's original application for permission for a reservoir was filed under Comp. St. 1910, § 744, providing that the party proposing to apply to a beneficial use the water stored in any such reservoir shall file with the State Engineer an application for a permit, in compliance with the provisions of sections 727-737, and the Engineer, under section 731, returned it for additional information, and a second application with the additional information was subsequently filed, the two applications are to be taken as one and the applicant given all the benefit of his priority under the first filing. *Laughlin v. State Board of Control*. Supreme Court of Wyoming. 128 Pacific 517.

DIVERSION DITCH.

An appropriator of water may adopt as his ditch, or a part thereof, a depression or slough, where it is feasible, and thus save the cost of the construction of a ditch. *Bennett v. Nourse*. Supreme Court of Idaho. 125 Pacific 1038.

FLOOD WATERS.

Flood waters which are of no substantial benefit to the riparian owner or to his land, and are not used by him, may be taken at will by any person who can lawfully gain access to the stream, and conducted to lands not riparian, and even beyond the watershed, without the consent of the riparian owner and without compensation to him. They are not a part of the flow of the stream which constitutes "parcel" of his land within the meaning of the law of riparian rights. *Gallatin v. Corning Irr. Co.* Supreme Court of California. 126 Pacific 864.

RIPARIAN RIGHTS.

Riparian lands, without reference to location on the stream or to any statutory appropriation, have equal rights to a reasonable use of the water, but nonriparian lands acquire rights to water by statutory appropriation alone, and the first appropriator in time is first in right. *Biggs v. Miller*. Court of Civil Appeals of Texas. 147 Southwestern 632.

RIGHTS OF RIPARIAN OWNER.

A riparian owner has no right to have any particular amount of water flow on past his land, even as against those who are diverting water to irrigate nonriparian lands; his right being limited to that needed to irrigate his own land. *Biggs v. Lee*. Court of Civil Appeals of Texas. 147 Southwestern 709.

REQUISITES TO APPROPRIATION.

Before the 1911 amendment (Laws 1911, c. 153, § 16) to section 17, c. 69, Laws 1895, and under the Irrigation Act of 1889 (chapter 68, Laws 1889), one who has constructed a canal for the purpose of carrying water for hire to be used upon the lands of others, and is ready and willing to furnish the water to such land owners as will take it, has made the only application of water to a beneficial use that he can make, and his right to an appropriation continues as a developing right until all lands along the canal for which

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the water was originally appropriated use the same, provided, formerly, that the water be applied to the land within a reasonable time, and, now, within the time limited by statute. *Enterprise Irr. Dist. v. Tri-State Land Co.* Supreme Court of Nebraska. 138 Northwestern 171.

PERMIT BY STATE.

Where a permit to appropriate public water upon lands belonging to the state is issued by the state engineer, such permit is an inchoate right, which may ripen into a legal and complete appropriation only upon the completion of the work and the application of the water to a beneficial use, and confers upon the person to whom the permit is issued no right under such permit against a stranger who subsequently secures from the state a better and higher right than is vested by virtue of the permit. *Tobey v. Ridgewood.* Supreme Court of Idaho. 127 Pacific 178.

PROTECTION OF EASEMENT.

Equity has jurisdiction of a suit by the United States against the owners of land acquired under the public land laws after the passage of Act Aug. 30, 1890, c. 837, § 1, 26 Stat. 391 (U. S. Comp. St. 1901, p. 1570), to enjoin them from interfering with its construction of an irrigation canal over such lands under the reservation of right of way therefor contained in said act. *United States v. Van Horn.* U. S. District Court, District of Colorado. 197 Federal 611.

WATER RIGHT REAL PROPERTY.

Under the Constitution and statutes of this state, a water right is "real property," and is an appurtenance to the land irrigated by the use of such water. *Paddock v. Clark.* Supreme Court of Idaho. 126 Pacific 1053.

RIGHTS OF RIPARIAN OWNER.

A riparian owner's right to water for irrigation is limited to the amount of water needed and used, so that, to determine that fact, the amount of land irrigated, the character of the soil, and the amount of water needed per acre must be known. *Hedges v. Riddle.* Supreme Court of Oregon. 127 Pacific 548.

WATER OPTIONS.

Where G. entered into an agreement with T., B. & P., whereby he gave an option to purchase certain water rights, and it was provided that T., B. & P. should investigate the water supply and the practicability of such project, and if they should find such project practicable they would pay to G. \$5,000 in cash and a paid-up water right for 80 acres of land, *held*, that said contract was an option, and T., B. & P. had the absolute right to determine the sufficiency of the water supply and the practicability of the project, and that they did determine that said project was not practicable, and so notified G., and thus terminated said option agreement. *Gard v. Thompson.* Supreme Court of Idaho. 123 Pacific 497.

POLLUTION OF WATER COURSES.

The title of an act which reads "An act to protect the rice planters and owners of the canals who use water for irrigation purposes against pollution of the streams by salt water, oil, and other substances, and also to protect the fish in said streams, and making it a misdemeanor to contaminate said streams by draining or permitting the said water to be drained in said streams" (Act No. 183 of 1910), does not ex-

press the purpose of punishing any one who fails to post tanks or reservoirs, under certain conditions; and that part of the act relating to the posting of tanks is therefore unconstitutional, as the Constitution requires that the object or purpose of every act should be expressed in its title. *State v. Dusón.* Supreme Court of Louisiana. 58 Southern 159.

MEASURE OF DAMAGES.

Where an irrigation company enters into a contract with the state to construct an irrigation system under the Carey Act of Congress (Act Aug. 18, 1894, c. 301, 28 Stat. 372-411), and the laws of the state, and procures the state to place certain land included within said irrigation system on the market, and a person makes a contract with the state for 40 acres of such land, and also makes a contract with the irrigation company for water for said land, and makes a payment thereon, and thereafter the irrigation company changes its canals, so that it is unable to furnish water for said tract of land, the correct measure of damages includes such damages as the purchaser has sustained by reason of expenses incurred, labor performed, or any outlay of time which he has made under the contracts after the execution thereof, and which he has suffered by reason of the failure of the company to comply with the terms of the contract, and in addition thereto all payments on the land and water right, with interest thereon. *Sommerville & Idaho Irr. Co., Limited.* Supreme Court of Idaho, 123 Pacific 302.

SALE OF IRRIGATION STOCK.

The purchasers of all the stock of an irrigation company, having the right to divert from a river 31 cubic feet of water per second, agreed that the corporation would convey to the sellers the water rights owned by it not theretofore conveyed to other parties. It having been ascertained that 25.87 cubic feet had already been conveyed, the corporation subsequently conveyed to the sellers 5.13 cubic feet. *Held*, that the contract and deed having been made with reference to existing conditions and with knowledge that the water would be delivered through an open canal, the sellers were only entitled to the amount of water then owned by the corporation and not previously conveyed; and hence, in an action for failure to furnish water, it was competent for defendants to show that, by reason of seepage and evaporation, the water rights which it then owned were insufficient to supply those to whom conveyances had previously been made, although, before the bringing of the action, the corporation acquired additional water rights out of which it could have supplied the sellers. *Lombard v. Schlotfeldt.* Supreme Court of Washington. 123 Pacific 787.

"APPROPRIATION."

The diversion of a definite quantity of water from the channel of a stream by the owner of land on the stream claiming right thereto as against other users not prior in time, is a claim by "appropriation," regardless of whether the water is diverted from the channel on his riparian land or beyond its boundaries. *Little Walla Irr. Union v. Finis Irr. Co.* Supreme Court of Oregon. 124 Pacific 666.

RIPARIAN RIGHTS.

The extent of a riparian owner's right to use

(Continued on page 197)

BENEFITS OF TILLAGE.

Objects of Soil Tillage.

Publicity Dept., Deere & Co., Moline, Ill.

Speaking in a broad way, drainage and any similar operation might be included under soil tillage; but, in the usual acceptance of the term, "soil tillage" refers only to those operations necessary to the preparation of soil for the planting of crops and the processes necessary for bringing these crops to maturity.

The principal reasons for all care and tillage are: To provide a growing place for desired crop; to liberate plant food; to conserve soil moisture; and to destroy weeds.

Tillage Before Plowing.

It has been proved by experience that very often tilling the ground before plowing is a profitable practice.

If land is disced before plowing, the trash is cut up and worked into the soil where it cannot prevent the furrow slice from making a good contact with the subsoil.

This operation also pulverizes any hard lumps thereby preventing large air spaces being formed at the furrow bottom. These spaces do not promote capillary action.

Then, besides, discing leaves the soil in good condition to absorb any water that may fall and the mulch formed also prevents to a large degree the escape of moisture already in the soil.

Tillage After Plowing.

After the ground is plowed, it should be disced and harrowed until all lumps are finely pulverized. This is because the delicate plant roots cannot penetrate hard lumps and are, therefore, deprived of much plant food.

Another thing, a finely-pulverized soil gives a much greater feeding area for plant roots than a lumpy one.

Tillage increases the availability of plant food elements by changing the arrangement of soil particles and bringing together those that have not before been in contact. It also changes the relation of the soil with air, water, salts and acids in the soil, making available plant food that would otherwise remain dormant.

Common-sense tillage will help the productivity of any soil, and in many cases it has made productive supposedly depleted lands.

Concerning Moisture.

Soil tillage, in its relation to soil moisture, consists in saving a greater portion of the run-off that would otherwise take place with the hard surface of our stubble fields unstirred. It also materially increases the storage capacity of the surface of such fields.

Tillage assists in the movement of moisture in the soil, by supplying a proper physical condition of soil particles and decaying vegetable matter. With proper tillage, losses from evaporation can largely be prevented.

Plants require lots of moisture, which must be gotten into the soil and held there till needed. Moisture in itself is plant food; but it is also the direct means whereby plants take up other plant foods from the soil.

An air-dry soil contains a very slight amount of moisture that has been absorbed from the air, and is known as "hygroscopic water." It cannot contribute to plant growth, and is of only indirect value in the soil.

Water that stands at a general level in the soil is known as "bottom water" when near the surface and surrounding the roots of plants. It excludes air from the soil, and produces an unfavorable condition for crop growth. When it is slightly below the region of root development in the soil, it can be brought to the plant roots by capillarity, and will furnish a good moisture-supply to the crop.

Capillary water will not move upward through a very loose soil. Neither will it rise above the bottom of the furrow unless the contact with the furrow slice is compact.

If hard lumps, trash, stubble, cornstalks, etc., are turned under, an insulation is formed at the bottom of the furrow which checks capillary movement of water. This is a reason for many crop failures, even when the soil is amply supplied with moisture.

Discing before plowing prevents such a condition.

On the other hand, stirring the top soil after plowing prevents loss of moisture by evaporation.

Whenever the surface of the soil is compact—as in the case of sod land or cultivated land that has become compact—this capillary water rises to the surface, resulting in rapid evaporation of moisture.

This fact has been proven time and again, both in humid and semi-arid sections.

The creation of a good earth mulch prevents this loss.

Therefore, one of the objects of discing, harrowing and cultivating is to conserve moisture by making evaporation more difficult.

Depth of Tillage.

Usually the deeper the cultivation, the more moisture saved.

It has been demonstrated that a 4-inch mulch saves 72 per cent of the moisture, an 8-inch mulch saves about 88 per cent, and a 10-inch mulch practically checks evaporation.

Depth of cultivation, of course, depends upon conditions and the crop being grown.

To get the best results in tilling the soil, as in any other farm operation, good judgment must be used.

QUINCY VALLEY PROJECT TO COST \$40,000,000.

Plans are being made by the Quincy Valley Water Users' Association to raise \$100,000 to complete the survey for the irrigation project in Quincy Valley. The bill asking for an appropriation of this amount to carry on the work was recently vetoed by the Governor after it had passed both houses at Olympia. The estimated cost of the project is about \$40,000,000. It will open 500,000 acres of irrigated land. The plan is to bring water from Wenatchee Lake in a big ditch, siphon it under the Columbia River, and put it on the broad, level acres of Grant county.

THE BEET-SUGAR INDUSTRY.

The U. S. Department of Agriculture's report on the beet-sugar industry of the United States in the years 1910-1911, recently issued by the Secretary in a 73-page pamphlet which contains articles on the work of the Bureau of Plant Industry on sugar beets, a general review of the beet-sugar industry in the United States, the sugar-beet in European agricultural economy, relation of adaption to the improvement of sugar-beet varieties for American conditions, farm practice in the Arkansas Valley, Colorado, suggestion on cultural methods in the sugar-beet industry, and sugar statistics. It is illustrated by two maps showing areas where sugar beets are grown, location of sugar factories, rainfall and frost data, and 6 other plates relating to the industry.

The average American consumes 82 pounds of sugar each year—and only ten pounds of that ration is now produced in this country. The farmers of the country should keep that money at home, in other words, put it in their own pockets, and the Department of Agriculture has been trying for 16 years to show them how and induce them to do so.

Sugar is a product of manufacture mainly from the farmers' sugar cane and sugar beets. Incidentally some sugar is produced from the sap of the sugar maple—the entire value of that product, both sugar and syrup, and the sorghum syrup, being only about \$15,000,000 annually, while the total value of the sugar beet and sugar cane industries of this country totaled \$117,000,000.

The cane sugar industry fared badly this year on account of the Mississippi River flood, the entire production including molasses and syrup being valued at only \$34,000,000.

Beet sugar is a comparatively recent product of this country, and can scarcely be said to have existed 20 years ago. The production during the 12th census year (1899) amounted to 81,729 short tons, while the 1912 product aggregates 700,000 short tons valued at \$73,000,000. The growth of this industry and the plans for its increase indicate that beet raising for sugar purposes is much desired by farmers for profit and cultural benefit to the land.

There are now in operation 66 factories in 17 states, which used during the past season 5,062,333 tons of beets produced on 473,877 acres, and the industry has become one of the mainstays and chief supports of agriculture under irrigation in the semiarid states. Yet this industry produces practically only one-eighth of the home consumption. The importation from entirely foreign territory now approximates 2,000,000 short tons annually. A home beet-sugar production sufficient to cut off this production would not affect the home cane sugar industry adversely, because that has so nearly reached its limit that any possible growth it may have from now on will not equal the annual increase in the country's consumption, which has considerably more than doubled in the past 25 years, and now is greater per capita than any other country except England.

With our present low average of $1\frac{1}{4}$ short tons of beet sugar per acre, it would require 1,600,000 acres to produce the 2,000,000 short tons now imported; or, as the acreage harvested the last year was slightly less than 475,000, it would need the produc-

tion of 2,000,000 acres under beets to equal the entire home demand, a condition to which for more than 80 years economists have looked forward.

In the 19 states adapted to growing beets there are about $2\frac{1}{2}$ million farms, and 278,719,622 acres of improved land. Therefore if every farmer in those states could cultivate 1 acre of sugar beets, some of the cane sugar from non-contiguous territory would have to seek another market. Or if one farmer in four in these states would plant a 3-acre patch and give it the care that could readily be bestowed upon so small a plot, it would be unnecessary for us to buy foreign sugar. Two-thirds of one per cent of the improved land in the states adapted to sugar beets would accomplish this result, and more than that acreage lies idle, absolutely unused, every year. Any one of the states of Illinois, Iowa, Kansas, Missouri, Minnesota, Nebraska, or Ohio could produce all this sugar and then have the beets come only once in a ten-year rotation; and several of the others could do it alone on a 5-year rotation. The devotion of the necessary 2,000,000 acres to the production of the sugar required for our own consumption would have an utterly insignificant effect in reducing the acreage of other crops, and in fact, the growing of the beets would actually increase the total yields of other crops, because of the effect of the beets upon the soil, for the thorough working of the soil necessary to grow a profitable beet crop increases the yield of everything else grown on the same ground in succeeding years, and the beets need occupy the soil but one year out of ten.

20,000 SHOES A DAY.

Mayer Boot & Shoe Co., Milwaukee, Now Has This Daily Capacity.

Milwaukee's great shoe manufacturing company, the F. Mayer Boot & Shoe Company, has just completed another large factory building consisting of seven stories and basement, 50x150 feet, which is to be used exclusively in the manufacture of Martha Washington Comfort Shoes. It is the largest single factory in the country devoted entirely to the manufacture of one type of shoes. Including the new Mayer Martha Washington building, the Mayer factories now have facilities for manufacturing the enormous quantity of 20,000 shoes per day.

The remarkable growth of the F. Mayer Boot & Shoe Company is a striking tribute to the sterling qualities of Mayer Honorbilt Shoes, as well as to the value of this paper as an advertising medium. Mayer Honorbilt Shoes have been advertised in our columns for years. Our readers must be familiar with them and no doubt many are wearers of Mayer Shoes.

This company has built up an excellent reputation, which it deserves. The quality of Mayer Honorbilt Shoes is known wherever good shoes are sold. Martha Washington Comfort Shoes especially enjoy a tremendous sale. On account of their great popularity, these shoes are much imitated, and our readers are warned to make it a rule when purchasing to look for the names "Mayer" and "Martha Washington" stamped on the sole.—(Advertisement.)

Reclamation Notes

CALIFORNIA.

A. J. Rich, of San Francisco, representing the Solano Irrigated Farms, has recently purchased two more big tracts which will be added to their holdings. This added acreage gives the Solano Irrigated Farms a tract of more than 100,000 acres. The entire tract is being placed under irrigation.

Notice of an appropriation of 3,000 inches from the Feather river has been filed by J. C. Martin, Jr., of San Francisco. The notice states that the water is to be used for irrigation purposes, and will be diverted from Feather river by a pumping plant. The point of diversion is on the river four miles below Oroville. The appropriation when fully utilized will irrigate 15,000 acres lying in the Oroville orange and olive district.

It is estimated that at least 4,000 acres will be planted to alfalfa in the Modesto irrigation district this spring. The new Oakdale irrigation district canals will not be completed and ready for water for three months, but the farmers are planning for the reception of the water and will have their fields in good shape when the water is turned on.

Fourteen hundred acres of land adjoining the city of Palo Alto has been purchased by a party of Spokane (Wash.) capitalists. The purchasers in-

clude D. K. McDonald and G. E. Snyder, both of Spokane, who plan to subdivide the tract for suburban homes. A pipe system of irrigation will be installed so that each five-acre tract will be irrigated.

The last section of the great irrigation system of the Consolidated Reservoir & Power Company, which is bringing the Whitewater River into land surrounding the town of Banning, is rapidly nearing completion.

Seventy-two thousand acres of land surrounding Riverbank, in Stanislaus county, has recently been placed under irrigation. The system is modeled after the big irrigation plants at Modesto and Turlock. The Oakdale irrigation district is to furnish millions of gallons of water to irrigate the Riverbank irrigated farms and other lands adjoining.

Superior Judge Arnot of El Dorado, recently rendered a supplementary decision in favor of the plaintiffs in the case of Byington et al. vs. the Sacramento Valley Irrigation Company. The opinion holds that an act of Congress gave each power under the old Central Canal a right to water and that the irrigation company has no right to charge for water rights in selling the land. As to the alleged threat of the irrigation company not to construct its system south into the plaintiffs' lands, the decision holds that failure to do so will be a violation of the company's charter. The court also holds that the plaintiffs are entitled to a share of the

Cut Out Your Big Pay-Roll Expense—Put a Buckeye Open Ditcher on the Job



Wherever big reclamation and irrigation projects are being carried on you will find the Buckeye Open Ditcher playing an important part—doing the work of a gang of 100 to 150 laborers and keeping costs and expenses down to the minimum.

This machine is doing wonderful reclamation work in the South and South-West. Vast tracts of land that were considered worthless have been made fertile, productive and valuable with the help of the Buckeye Open Ditcher. It is provided with broad, apron trac-tions which carry it over ground too wet and soft to support even a team and empty wagon.

Whatever the nature of your work be, there's a Buckeye adapted to it. Many sizes, cutting ditches from 2½ to 12-foot top.

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**The Buckeye Traction
Ditcher Co.**
FINDLAY, OHIO

water; that judgment should be entered for them, and that judgment should be entered preventing the company from claiming ownership of water and conveying it to lands outside before the requirements of the owners are satisfied.

IDAHO.

The Secretary of the Interior has issued a public notice that a pumping plant and a distribution system for the irrigation of high lands known as the West End Extension of the Gravity Unit of the Minidoka project in Idaho, now under construction. It is expected that water will be available for irrigation during a portion of the season of 1913. Water will be furnished on a rental basis upon the completion of the works at 75 cents per acre, for the season, payable on December 1, 1913. This rental charge shall not attach against such of the high lands in this extension as do not receive water in 1913.

A thorough investigation of the duty of water will be made on the Salmon tract this year, according to Mr. Don H. Bark, of Boise, government irrigation expert. In view of the difficulties and problems connected with the use of water on the Salmon tract, it is stated that more extensive work will be done on the tract this year than ever before, and Mr. Bark is authority for the statement that it will be the purpose of himself and associates to very carefully determine the duty of water for the different types of soil, as well as transmission losses in the canal systems.

MONTANA.

The Director of the Reclamation Service is advertising for bids for furnishing five, more or less, 70-ton electric power shovels for use on the Milk River and Sun River irrigation projects in Montana. The bids will be opened at the office of the Reclamation Service at Great Falls, Mont., on April 30.

The Director of the Reclamation Service is advertising for bids for two, more or less, steam shovels for use on the Milk River irrigation project in Montana. The bids will be opened at the office of the Reclamation Service at Babb, Mont., April 28.

The Director of the Reclamation Service is asking for proposals for the construction of the Pishkun Reservoir Supply Canal, the Sun River Slope Canal, and Tunnels No. 2 and 3 in connection with the Pishkun Reservoir Supply Canal, in connection with the Sun River irrigation project in Montana. The work involves the excavation of about 2,400,000 cubic yards of material and the construction of about 3,215 linear feet of concrete lined tunnel. It is located on the north side of Sun River, 25 to 27 miles west of Great Falls. The bids will be opened at the office of the Reclamation Service, Great Falls, Mont., April 30.

Peter Ivanoff, a contractor of Hamilton, Mont., has been awarded contract by the Bitter Root Valley Irrigation Company for the planting of 1,200 acres of the company's land east of Florence, to

apple trees. The holes for the trees will all be dug with dynamite, and Mr. Ivanoff estimates that it will take a carload of explosive to do the work. The use of explosives in digging holes for tree planting has become general throughout the west, having been found the cheapest and quickest method of doing the work.

Bacon & Davis of Valier are opening up a large tract of irrigated land near that city, and they have awarded a contract to the Enterprise Sheet Metal Works of Billings for two carloads of steel flume. The contract price is estimated at \$10,000. The material will be shipped direct from Billings to where the flume is to be erected and will be manufactured on the ground.

The Northern Pacific Railway Company has granted permission to the Lockwood irrigation project promoters to build their pumping plant upon the railroad right of way and to cross the right of way and the tracks with the pipe line. The permit has been in abeyance for some time, but was secured without difficulty and no charge is made by the railway company for the rights given the water company. The new pumping plant which is to house the three mammoth centrifugal pumps is to be built of concrete throughout. The pumps will supply 3,000 acres near the town of Billings with water for irrigation.

The United States has filed a water right with the county clerk of Flathead county for the use of 100,000 cubic feet per second of the waters of Flathead River for use on 50,000 acres of land in townships 20, 21, 22 and 23, and also a water right for 1,000 cubic feet per second of Big Creek to be used on 30,000 acres of land in townships 20, 21 and 22.

UTAH.

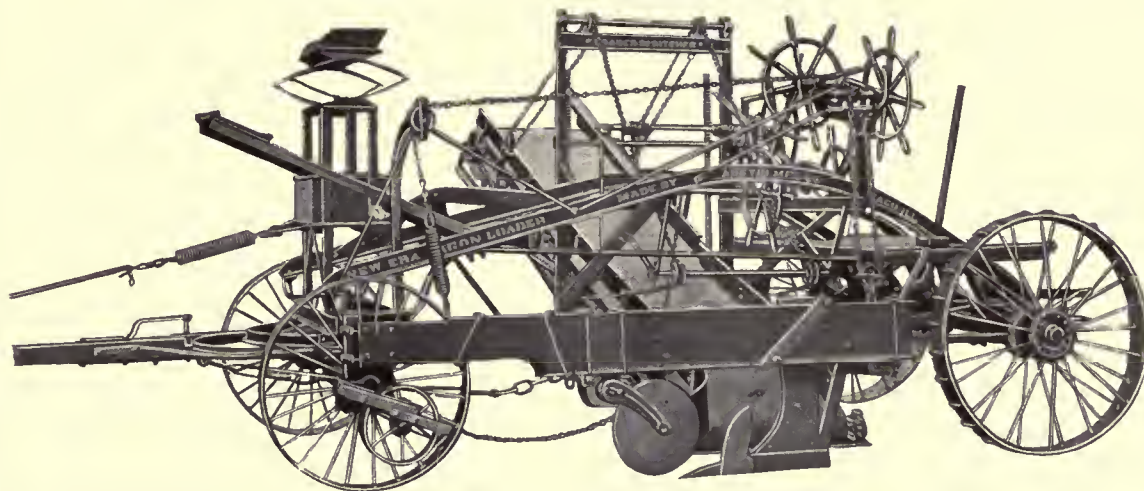
At the request of the Deseret Irrigation Company the state land board recently authorized the temporary withdrawal under the Carey act of 120,000 acres of land in Millard county. The tract is to be reclaimed by a great irrigation project about to be launched just north of the Delta project in the same county.

Articles of incorporation have been filed with the county clerk by the Co-op Farm Irrigation Company. The company is capitalized at \$10,000, the 500 shares having a par value of \$20, and the entire capital stock is paid up, with rights to 1,000 inches of water from the south fork of Ogden River. The incorporators, who also constitute the first board of directors, are Geo. McFarland and James Burrows of Ogden, Wm. H. Burrows, David Randall and Isaac Smith of Huntsville. The object of the incorporation is to deal in water rights, construct reservoirs and operate power plants.

Reclamation of 6,000 acres of alkali land on Six-mile ridge, between Salt Lake City and Saltair, is to be undertaken immediately by the State Reclamation Company of Salt Lake City.

(Continued on page 190)

Recent Developments in Austin Earth Handling Machinery



The New Era Elevating Grader

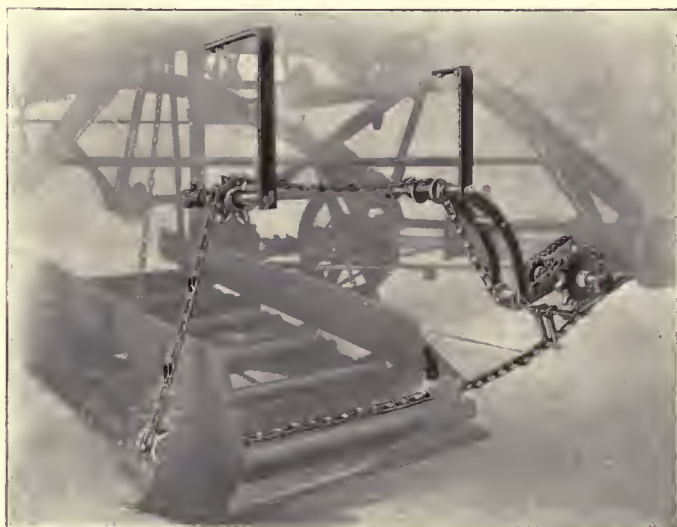
for over fifty years the leader and pioneer for economical earth handling, has advanced still higher in the estimation of practical earth handling contractors by its recent improvements.

1. The Austin reversible earth deflector.
2. The Austin roller bearing disc plow.
3. The Austin automatic sand pan cleaner.

The Austin Automatic Sand Pan Cleaner has solved the trouble and saved the delay and wear from adhering earth in the sand pan.

Our illustration explains its simplicity and effectiveness.

This feature consists of an endless sprocket chain provided with scrapers, the same traveling slowly from end to end of the sand pan over suitable sprocket wheels, shafts and idlers; the chain being driven from a sprocket attached to the rear axle of the machine. (It will be seen that the chain traveling through this space not only prevents the earth from packing but that the scrapers on the chain remove it.)



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Order from B. C. BUFFUM, Worland, Wyo.

The amount of water needed in irrigation on the Strawberry Valley project has been tested carefully by measurements made during 1912 on a large number of farms irrigated from Spanish Fork River, south of Provo. The results which have been received and studied by the reclamation service show that the amount used has varied from less than an acre-foot per acre up to between two and three acre-feet, there being the unregulated demands of the farmers and in accordance with their habitual practice. It is stated that good yields of alfalfa have been produced with 1.6 acre-feet, and good crops of wheat and oats with from 1.24 to 1.6 acre-feet. The best crops of barley were raised with less than 1.7 acre-feet. Sugar beets yielding from 24 to 27 tons per acre were produced with 1.66 to 1.92 acre-feet.

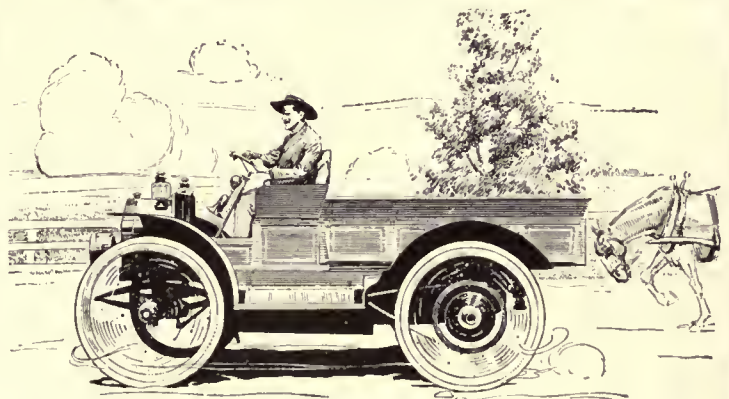
WASHINGTON.

The Secretary of the Interior has issued a public notice announcing that the settlers under the Tieton unit of the Yakima irrigation project in Washington, who have cultivated and reclaimed one-half or more of their irrigable land, may have the benefit of a graduated scale of water right payment. New entrymen can secure a certain part of these benefits if at the time the second instalment becomes due such entryman shall have reclaimed and cultivated not less than 25 per cent of the irrigable area of his entry, and if when the third

(Continued on page 191)

Only Half an Hour From Town

MODERN business men and farmers have ceased to measure distances by miles. Minutes serve instead. "We are just half an hour from town," says a farmer who lives seven miles out and owns an International car. "I went to town today, starting half an hour after my neighbor went by my gate with his team, and I passed him just where the main street paving begins. We visit every friend within thirty miles, hear lectures, see entertainments, have a better time in every way since I bought an



International Commercial Car"

An Ohio business man says: "When I am using my International Commercial Car the expense is about the same as with a team, but when it is not in use it is not eating, and, therefore, costs nothing. After a year's experience, I find the repair bills to be no more than the bills for shoeing, harness repairs, wagon repairs, painting, etc., and there is the added advantage of getting around three times as fast."

An International Commercial Car can be used in all seasons when the road is passable to horses. The wheels are high enough to give ample road clearance. Solid tires give good traction and eliminate many tire troubles. The engine is simple and powerful. It will pay you to know all about the International Commercial Car. A letter brings full particulars with many interesting facts and figures.

International Harvester Company of America

(Incorporated)

705 Harvester Building

CHICAGO U S A

When writing to advertisers please mention The Irrigation Age.

THE AUTO AND THE FARMER.

R. E. Olds, president, Reo Motor Car Company, says there must be some good reason for the wide use which the thrifty and practical farmers are making of automobiles throughout the country, and more especially, of the high-quality, low-priced makes. The motor car evidently must pay the farmer good dividends on his investment for he is not given to spending his money foolishly. He must get a goodly measure of results by way of saving time, labor and money with his motor car. He and his family must be getting much pleasure, comfort and satisfaction with the automobile so long as the use of power vehicles continues to increase so remarkably everywhere among farmers.

One of our live and enthusiastic farmer patrons recently wrote us how his automobile furnished the power for blowing hay over 100 feet up into a hay mow, whereby one man now easily did more than what three men and two horses formerly did. This he does by jacking up the rear axle and harnessing the motor to one of his old discarded blowers. I can pretty nearly realize the joy and satisfaction which came to this man as a result of saving much time, labor and money with the power plant of his motor car while utilizing a discarded farm implement.

Another farmer says that he markets all of his wheat and corn with his car by the aid of a trailer. Besides, he now is able to get to the city much oftener and sell his product direct without the aid of the middleman—an important factor in reducing the cost of living to the consumer. What is even of greater importance, he has happily solved the problem of how to keep his boys and girls contented on the farm. Under such conditions they would never swap the farm for the shop, while their city cousins trudged back and forth from their work, either afoot or as a straphanger, while working for a scant living salary.

Then I recall another farmer who puts his car to many practical uses on the farm besides running business errands with it. When the ground is dry and hard he hitches his automobile to a disc plow and cultivates his large orchard in six hours which formerly required from 12 to 18 hours with three horses. He also harnesses his motor power to his corn sheller and thresher, and when the soil is in proper condition he plows, cultivates and sows grain with his car, keeping a horse or two in reserve for emergency only. It is really surprising how many uses a car may be put to on a farm with the exercise of a little mechanical ingenuity.

It is very gratifying to me that hundreds of the cars which I built in 1905, and prior thereto, are still doing yeoman service today. That is due to two things, namely: good construction and good care on the part of the owner and driver.

As the secret of long life in man lies in good food and proper care, so with a high-quality, reliable car. Give it the best of gasoline, oil and grease, combined with careful driving and reasonable protection against the elements and against the extremes of heat and cold, barring tires, a car of known honesty and reliability of construction should last a farmer from six to ten years.

The farmer's life is, at the best, frequently full

of drudgery and monotony; even those who count their acres by the hundreds, if they are making a success in their line, cannot get rid of a certain amount of monotony, and it is this monotonous, day in and day out grind, more than anything else, that causes the farmer to break down in middle life. His wife at forty often looks as old as her city sister of fifty-five, while his children drift cityward, where they invariably live up more than they can earn.

To the modern farmer these days are passing. He realizes that he must not put all his dividends back into working capital, such as land, stock, etc., and leave a great fortune for his city children to law over. But, if he takes more than a narrow interest in his family he finds that he must make the farm home as near ideal as possible, and he puts his money into modern living just as his city brother is doing, and with his modern home equipment, there must follow the motor car.

He finds that hired help, both on the farm and in the home, are less difficult to get and keep, and that they will take more interest in their work if he does not forget them once in awhile in his "spins," and also his less fortunate neighbor in this world's goods seems to have a better opinion of him if he remembers them occasionally. He finds as the years come and go that his family does not think farm life such a drudgery after all. That his boys take more interest in farm stock and farm work, and somehow the city does not seem near so attractive as it once did.

In view of these facts it is apparent that the motor car, more than any other one thing, will help solve the farmer's problems. The land owning man who is running ahead every year is the man who stays on the farm, and buys a motor car. By so doing he keeps on the farm the brain and brawn which belongs to it, and thus finds that the motor car pays.—(Advertisement.)

RECLAMATION NOTES.

(Continued from page 190)

payment becomes due 5 per cent of the irrigable area covered by his entry shall have been reclaimed and cultivated he shall obtain the full benefit of the schedule of graduated payments which is as follows: First instalment, \$9.30; second instalment, \$1.50; third instalment, \$3; fourth instalment, \$4; fifth instalment, \$5.20; sixth, \$10; seventh, \$15; eighth, \$15; ninth, \$15; and tenth, \$15.

Northern Pacific engineers are at work north of Prosser making surveys for an irrigation project to cover about 200,000 acres of land above the Sunnyside government canal in Benton and Yakima counties. Surveys and plans for this project were started three years ago by the Yakima High Line Ditch Association. The Northern Pacific Company owns about 70,000 acres of arid land under this project. About 50,000 acres of the land under the survey is in the Rattlesnake Hills north of Prosser.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics, add \$2.50 to above price.

THE WINNER



THE machine that leads all eighth yard mixers for design, principle, cost of operation, convenience of operation, thorough of mix and low price. Get our catalog and learn *Why*.

The Cement Tile Machinery Co.
175 Rath Street, WATERLOO, IOWA

AILMENTS AND COMMON SENSE TREATMENT OF POULTRY.

It is the truth that sickness visits the yards of the beginner more frequently than it does the yards of the veteran. And why? Surely the beginner aims to give his flocks the best of care, sparing neither time nor expense, but, withal that there is something lacking—there is a reason for it.

To the veteran, the art of prevention is worth more than the art of cure. He believes in doctoring the slight ailments, but will not tolerate a downright sick bird on the place.

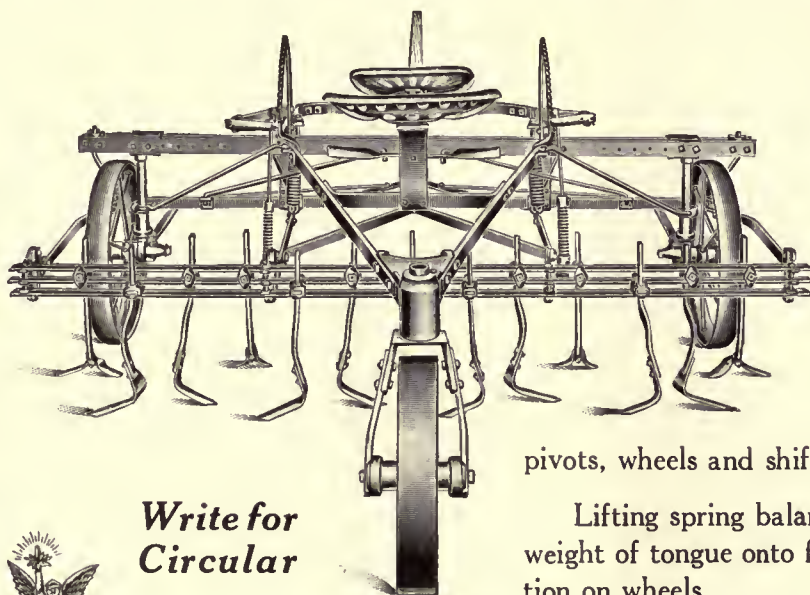
On the farm of the writer there is a building that contains a number of cages. If it is noticed that a fowl has a cold, it is at once removed to one of these cages and treated to a one-grain quinine pill each night for three nights in succession. Generally, in a week's time the bird is well. If, however, the cold should be a bad one, from a half to a full teaspoonful of whiskey is added to the drinking water. If the face is swelled, it is bathed with hot water and rubbed with vaseline. If after that the bird seems to grow worse, off goes the head.

If a droopy fowl is found, it is removed to a cage,

We Duplicate all Infertile Eggs. White and Columbian Wyandottes, Single Comb White Leghorns, and Light Brahas. We use trap nests. In business for 30 years. Brahma eggs, \$3 for 15; \$5 for 30. The other varieties \$2 for 15; \$5 for 50, \$10 for 100. Address

Michael K. Boyer, Box 18, Hammonton, New Jersey

Moline Four-Row Beet Cultivator



*Strong, Simple
and Durable*

Gangs are adjustable to rows planted 14" to 24" apart.

Easiest to Operate

Operator controls cultivator entirely with his feet. Foot lever

pivots, wheels and shifts gangs at same time.

Lifting spring balances machine and transfers weight of tongue onto frame, thus increasing traction on wheels.

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Circular*

COLORADO MOLINE PLOW CO.
Denver, Colo.

WESTERN MOLINE PLOW CO.
Salt Lake City, Utah



given a family liver pill, and in a week's time there is a change for the better or worse—if worse, off goes the head.

The veteran is particular about cleanliness; he avoids overcrowding; he does not believe in close, tight-fitting houses; he feeds only the purest of food.

Fowls cannot stand drafts any more than can human beings, but they want fresh air.

The beginner, with kindness in his soul, builds an air-tight house, which is in reality more cold to the fowls than the open front houses. They may be comfortable at night, but during the daytime, if the fowls are not left outdoors, they will stand about the pen inactive, and suffer more than if compelled to scratch. They need the fresh air and the light.

Exercise and the proper food are the keynotes of success. It is natural for a hen to be busy, and it is safe to say that the idle hen is not a well one. Keep them in good health, being careful that they do not get such food as will overfatten, and they will keep busy, and it is the busy hen that pays her board and leaves a neat profit for her owner.

It will pay to whitewash the interior of every pen both spring and fall. It is the only way to sweeten the place and keep down vermin.

And here, too, is another point. There can be no health where lice are allowed to thrive. With all precaution it is not always possible to keep a house entirely free from these pests, but by strict cleanliness it is possible to keep them down to such small numbers that they can do no particular damage. We not only clean up the manure daily, and whitewash

(Continued on page 195)

Books on Irrigation and Drainage

The *Irrigation Age* has established a book department for the benefit of its readers. Any of the following named books on Irrigation and Drainage will be forwarded, postpaid, on receipt of price:

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The results of experiments with alfalfa have clearly shown the possibility of improving this valuable crop.

Comparative tests and systematic methods of seed selection have been carried on to fix, combine, and develop the superior traits that have been found in some of the best strains of alfalfa from different sections of the

world. But to do this, and increase the progenies of these types for commercial use, will require several years to accomplish. In the meantime, present results seem to fully justify the advice to farmers, to sow the Baltic or Grimm's alfalfa seed, especially when the seeding is made with a view to seed production as these two strains have proved to be among the best. There are points of decided merit in these over most of the imported and ordinary strains of alfalfa.

Some of the points of superiority found in these hardy northern strains can be enumerated as follows:

1. **Hardiness and frost resistance**—They have the ability to survive winter conditions where ordinary alfalfa has failed or has been seriously injured. This is due to the difference in the stooling habits, the hardy strains having protected underground buds and shoots spreading beneath the surface of the soil, while the non-hardy types grow more upright with their buds more exposed to frost.

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3. **More adapted to different soil conditions**—These heavy stooling types have more branched roots near the surface of the ground. They also have a tendency to take root from the lateral branches of the crown, thus making this type of alfalfa better adapted to shallow soil, or soil with ground water near the surface. They are also better for dry land conditions where the root development must be necessarily near the surface as the plant must develop from superficial moisture. Yet under irrigation these strains seem to have the same deep root system as other alfalfas.

Early blooming habits—This doubtless is an advantage in several respects. For instance, lengthening the period for honey flow, and earlier maturity of the first crop of hay, thus lengthening the time for subsequent crops to develop. Early blooming is also an advantage in seed production.

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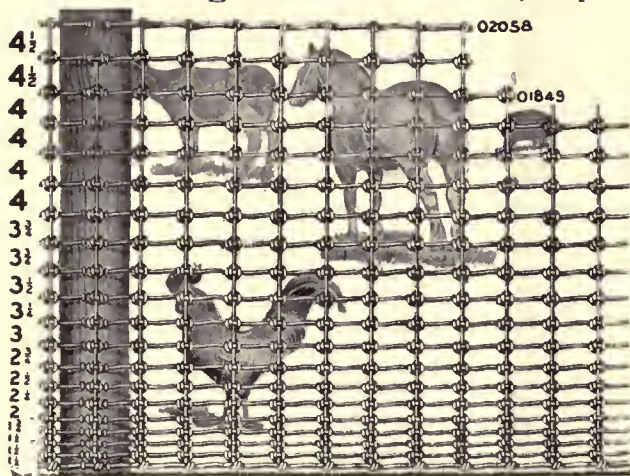
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AILMENTS AND COMMON SENSE TREATMENT OF POULTRY.

(Continued from page 192)

the premises every year, but every week or so we pour kerosene on the roosts, and in the corners of the nest boxes, and sprinkle insect powder among the nest material. It is seldom that we see a louse, and if we have a bird that has "gone light," or is droopy, it is so from some other cause than vermin. If more care should be given to this louse question, as well as in feeding so that the flock will not overfatten, there will be less cases of reported "cholera." Is it not strange that when we hear of ravages of cholera it almost invariably is among the flocks of either a beginner or a careless man?

And the good method for preventing disease is to disinfect the houses every month or so by burning sulphur in them. Take an old iron vessel and set it in the center of the pen. Then take a pound of sulphur and wrap it in a newspaper. See that every window is closed, and that all the fowls are out of the house. After setting a light to the paper get out of the building and close the door. It will not take long before the interior of the pen will be black with smoke. Leave it burn for an hour or more, after which open up the doors and windows and let the place air well before the fowls are ready to go to roost. This fumigation will not only kill any disease germ that might be in the building, but it will also destroy all vermin that the fumes will reach.

Another common cause of sickness is inbreeding. We realize in saying this that we are apt to raise a discussion, for it is surprising how some of the very best poultrymen in the country still cling to the belief that inbreeding is not harmful. But their number is becoming smaller every year. Inbreeding no doubt retains certain markings and characteristics of a strain, but it does not maintain ruggedness. We find, after quite a number of years' experimenting, that new blood can be gradually added to a flock and not harm the strains' trade marks, but it must be judiciously done. Introducing new blood recklessly is as bad as inbreeding, and therefore the poultryman is compelled to study the question well, and to secure his new blood only from such sources as are in line with his own stock.

In breeding turkeys, relationship must be avoided. If the cock bird has considerable wild blood in him, the offspring will be stronger. Where inbreeding is practiced, after a few years the young will be liable to have crooked breasts and other deformities.

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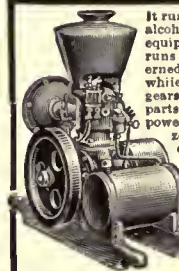
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SUPREME COURT DECISIONS.

(Continued from page 184)

water for irrigation is indefinite, uncertain, and subject to fluctuation, as it must always be dependent on the future like needs of other riparian owners; there being no priority of rights between them, and no riparian ownership of a definite amount of water as against other riparian owners. *Little Walla Irr. Union v. Finis Irr. Co.* Supreme Court of Oregon. 124 Pacific 666.

POINTS OF DIVERSION.

Where a decree adjudges the amount of water which several canals or ditches may take from a stream, and fixes their relative priorities, and limits the points of diversion, the officers charged with the control of the distribution of the water may not recognize any right to change the points of diversion or deliver water at any other points than those specified until permission is granted by the court. *Monte Vista Canal Co. v. Centennial Irrigating Ditch Co.* Court of Appeals of Colorado. 123 Pacific 831.

CHANGE IN POINTS OF DIVERSION.

The right to change the point of diversion of water, under Sess. Laws 1903, p. 278, authorizing the changing of the point of diversion where the change will not impair or injuriously affect the vested rights of others, as well as independent of the statute, is a qualified property right, subject to the condition that it can be exercised only in case a change will not injuriously affect the rights of others. *Monte Vista Canal Co. v. Centennial Irrigating Ditch Co.* Court of Appeals of Colorado. 123 Pacific 831.

ENFORCEMENT OF DECREE.

A decree adjudicating priority among conflicting claimants to water rights and quieting titles thereto, which establishes the status of the parties and property involved, is self-executing; and the court has no further power to appoint commissioners to compel rotation in the use of the water, which is an administrative and not a judicial act. *Am. Realty Co. v. Big Indian Mining Co.* U. S. District Court, District of Montana. 198 Federal 367.



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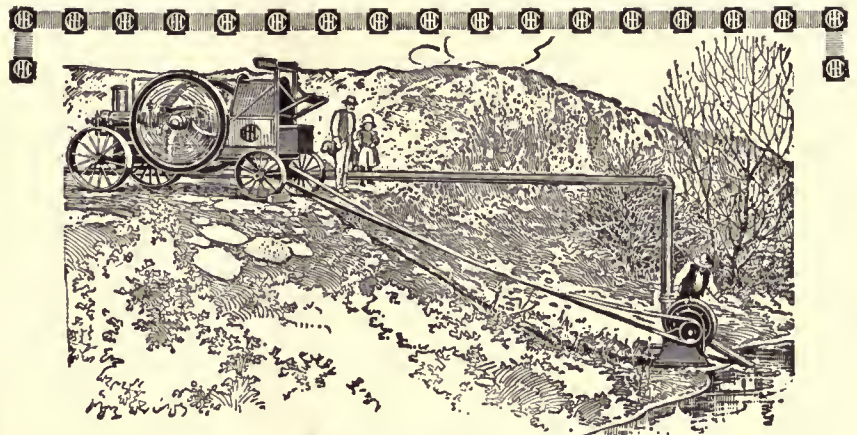
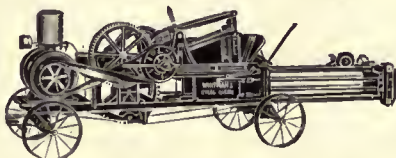
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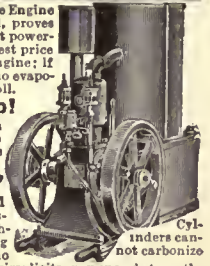
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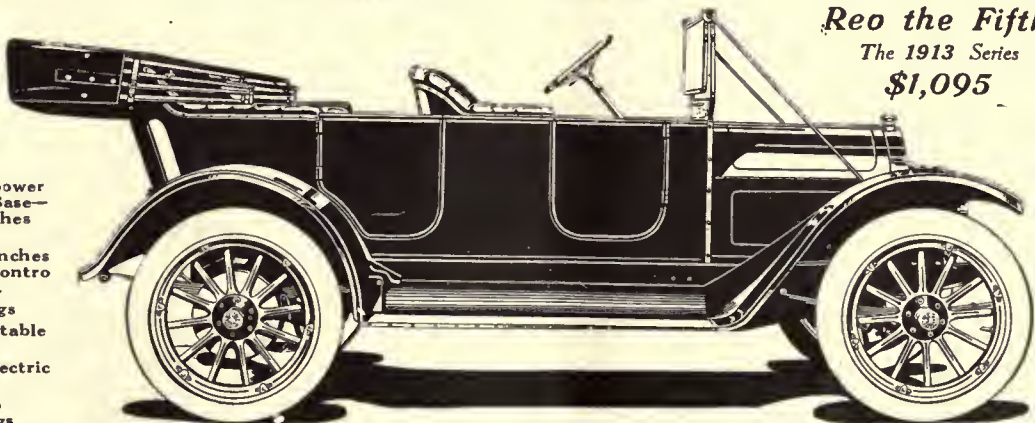
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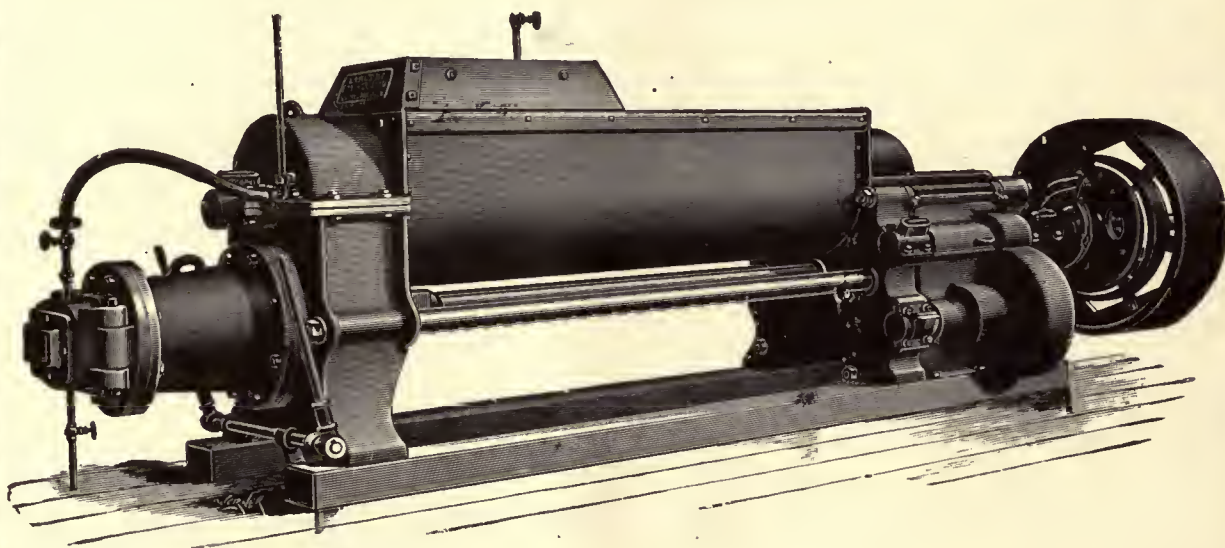
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Top and windshield not included in price. We equip this car with mohair top, side curtains and slip cover. windshield, Prest-O-Lite gas tank for headlights, speedometer, self-starter, extra rim and brackets—all for \$100 extra (list price \$170. Gray & Davis Electric Lighting and Starting System at an extra price, if wanted.)

UNION MACHINES WITH PUG MILLS COMBINED



FIVE SIZES ALL CAPACITIES

Outfits for Drain Tile, Hollow Ware, Building
and Paving Brick and other Clay Products

If interested write us for particulars and estimates.

E. M. FREESE & CO.
GALION, OHIO

Hollow Core Wall for Hydraulic Fill Dams

In a Hydraulic Fill dam the problem of the drainage of the sluicing water is of controlling importance. The sluiced material should be such that it will not retain the sluicing water for an undue time. If the material is such that it will not deliver the water with reasonable rapidity a decided settlement with consequent cracks is bound to ensue when the fill ultimately dries out.

The sluicing water on the fill is maintained in a summit pool by hand-made levees. It is found that in depths downwards to 5', the material in suspension becomes comparatively solidified and it will then hold its shape and consistency. The sluicing water, however, must necessarily be under constant drainage if rapid construction and solid banks are expected.

A Hydraulic Fill dam during construction generally has water in the impounding reservoir above it which rises at substantially the same rate as the increasing height of the dam, but a little below its level, thereby reducing the drainage head in that direction. Assuming that there is no core wall, the sluicing water is forced to pass largely through the down stream fill unless drainage tubes in some form are provided. The passage of the drainage water through such a mass of material is slow, and hence full advantage cannot be taken of the otherwise rapid method of hydraulic construction.

Again, the material of the fill will not take its final set until the fill is complete. The fill is therefore saturated during construction, and saturated material is always of greater bulk than dry material. This fact accounts in a measure for the excessive settlement in hydraulic fills.

All this is controlled by building a Hollow Core Wall through the center of the embankment, and providing it with numerous drainage gates of simple construction. A facing of broken stone or gravel should be placed next to the upstream face of the core wall.

It is evident at a glance that with this construction we have accomplished two things:

First, we have provided an effectual water-barrier whereby when the lower prism of the dam is once drained it is forever protected against re-saturation.

Second, the problem of drainage is entirely under control and can be hastened or retarded at will. Drainage head is secured in two directions, namely, towards the core and towards the toe. The material more quickly receives its final set and unexpected settlement is thereby avoided. The time of construction is greatly hastened.

Moreover, in the usual form of construction the levees on the outside edge of the pond frequently give way and permit a localized washout on the slope of the fill. The central drainage into the Hollow Core Wall permits of instant relief of excessive water and makes a washout impossible.

Again, if the sluicing material is such that it settles rapidly, the surface water can be quickly drawn off into the Core Wall.

Once the fill is completed the drainage gates into the Core Wall from the lower prism are permanently opened. This insures an absolutely dry prism; a result never before reached.

The above is a mere outline of the functions of the Hollow Core Wall in relation particularly to the Hydraulic Fill during construction. The advantages named in a previous advertisement in connection with an ordinary rolled earth dam apply in full to the Hydraulic Fill when the same is completed and in permanent service.

The above notes are fairly illustrated by the sectional drawing herewith presented which roughly represents a Hydraulic Fill Dam in process of construction. The Hollow Core Wall is carried up to and a little above the ultimate embankment and provides interior inspection through the heart of the fill.

This topic is more fully treated in our Circular on EARTH DAMS. The introduction of the Hollow Core Wall entirely changes the basic problem of an earth dam, whether of rolled earth or hydraulicked into place. These points will not admit of discussion in an advertisement.

Respectfully submitted,

AMBURSEN HYDRAULIC CONSTRUCTION CO.
ENGINEER-CONSTRUCTORS, 88 Pearl St., Boston, Mass.

All inquiries from Canada should be addressed to
Ambursen Hydraulic Construction Co.,
405 Dorchester St., West, Montreal, P. Q.



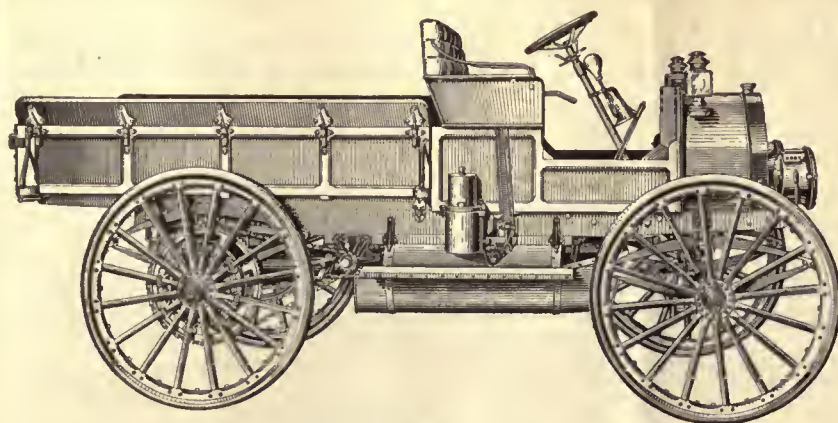
HYDRAULIC FILL DAM WITH HOLLOW CORE WALL IN PROCESS OF CONSTRUCTION

SPECIAL NOTICE

We take pleasure in announcing that we have perfected an arrangement whereby Messrs. Lewis & Wiley of Seattle, Washington, become associated with us in all work involving the sluicing of earth for the construction of dams or for any other purpose. The reputation of the above concern was made in the famous re-grade of Seattle, whereby the hills of that city were cut down and used for fill on the water front. A similar contract has been carried out by this company in Portland, Oregon, and a third one is now in progress in Seattle.

Messrs. Lewis & Wiley are undoubtedly the foremost concern in the world in this special line of work, and we deem ourselves fortunate in securing their association with us.

**AMBURSEN HYDRAULIC
CONSTRUCTION CO.**



Can You Use This Truck

If your business is one that demands prompt deliveries, or requires a great deal of light hauling, you can use an International Motor Truck, perhaps more than one, and save money by its use.

With seven years of experience to teach us, we have developed this truck along the lines of greatest usefulness and closest economy for the use of business men in city and country. The improve-

ments made have all been dictated by experience and they have all been of the kind technically known as refinements. The 1913 model is an efficient business wagon, just what you need to put your delivery service on the most up-to-date and economical basis.

International Motor Trucks

are furnished with any style of body desired. Our agents are instructed to see that your driver thoroughly understands the car before he takes charge. A repair part service is maintained at each of our general agencies, located in nearly a hundred of the principal cities of the country, protecting you from delays caused by unavoidable accidents. You are safe in buying an International Motor Truck. It saves money and it makes money for the man who can use it.

If you are that man, write us and receive catalogue and full information. The longer you delay the more you lose.

International Harvester Company of America

(Incorporated)

Harvester Building

CHICAGO U S A

The Two Leading Magazines of Their Kind in the World

IRRIGATION AGE CHICAGO, ILL.

The pioneer and only publication of its class in the world. Published monthly. Special articles each month by authorities on irrigation. Invaluable to the homeseeker, engineer, expert, colonist and irrigation farmer, and all those in any way interested in irrigation.

The publisher of Irrigation Age has recently purchased the National Land and Irrigation Journal of Chicago and the Irrigator of North Yakima, Wash., and the combined circulation of both has been merged with that of the Age.

One Dollar Per Year

Irrigation Age

30 N. Dearborn St.
CHICAGO

BETTER FRUIT HOOD RIVER, ORE.

A beautifully illustrated monthly magazine, published in the interests of modern and progressive fruit growing and marketing. The editorials are strong features. Better Fruit is edited by a practical fruit grower, who has been in the business for many years. Consequently, Better Fruit contains just what the fruit grower wants to know.

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Better Fruit Pub. Co.

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OREGON

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Enclosed herewith find \$1.50 for which please send me THE IRRIGATION AGE and "BETTER FRUIT" for one year.

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When writing to advertisers please mention The Irrigation Age.



This splendid 70 gallon vertical suction, centrifugal Buffalo Pump for only

\$28.50

Larger Sizes in Proportion

"Buffalo" Vertical Suction Centrifugal Pump—the highest pump value ever offered at the price

We are prepared to make stock shipments from factory of this highly recommended and exceedingly popular irrigation pump, used for heads not exceeding over 50 feet. It belongs to the trade-marked "Buffalo" Class M family, which has won just recognition as the highest value obtainable in popular priced centrifugal pumps. The outfit includes pump, pulley, companion flanges and coupling for both suction and discharge, as shown. Only the finest white babbitt metal is used in the extra long bearings, which are furnished with brass compression grease cups. Thrust bearing is of ball bearing type. It may be installed by attaching the suction flange directly to the well casing, the pump itself being set between two vertical timbers, which also carry the shafting, bearings, etc., and is driven by pulley located above the ground at top of the well. Bearings, shaft collars, and steel shafting can be supplied at a slight extra cost to suit your individual requirements. Being accurately made and fitted, all parts of the pump are interchangeable and can be promptly duplicated at any time. Couplings are bored same size as shaft and bearings. Larger sizes also made. The price quoted is f. o. b. our factory.

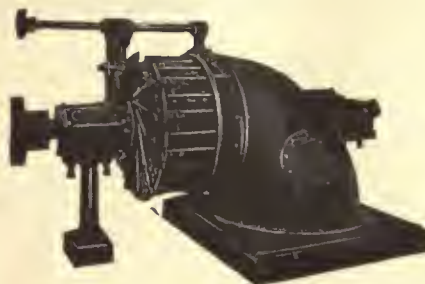
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BUFFALO STEAM PUMP CO.
Buffalo, N. Y.

Agents Wanted for our complete line of pumps for every purpose

SAMSON TURBINE



When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

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Rural Road Grader and Ditcher



Cutting V-Bottom ditch on Slope of $1\frac{1}{2}$ to 1.

The successful irrigation ditch or lateral must be cut clean, with slopes smooth and undisturbed. This machine was especially designed to meet these requirements. One horse and wheel traveling in point of ditch, the other outside the bank of earth. Operated by one or two men and two or four horses.

If you have an irrigation problem to solve, do not fail to write for full information concerning this Combined Grader and Irrigation Ditcher.

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MAKE MONEY MAKING CEMENT TILE

The field is unlimited and uncrowded; marketing the product in competition with the clay interests and at clay tile prices produces a great profit and a glance at the future spells only success for the factory or business started today.

No existing proposition offers such flattering inducements or such a field of opportunity for the man looking for a vocation or for the man looking for an investment. No other business can net you such profits on the amount of capital involved, and no other business has such an unlimited future.

Just think of a business paying from 30% to 50% on the investment the very first season, and subsequently from 50% to 150%, then ask yourself the question—Is it worthy of investigation?

Our literature gives you all the details regarding the merits of cement tile, the cost of manufacture, the amount of capital required to embark in the business; how to build your factory and last, but not least, it tells you how we aid the manufacturer using our machinery and gives you our full and complete proposition. A short letter telling that you are interested will bring complete data.

The Cement Tile Machinery CO.

172 Rath St., Waterloo, Iowa.



DITCH TWO FEET DEEP

Notice clean cut sides. Nothing to obstruct rapid flow of water.

THE 20th CENTURY RECLAMATION GRADER and DITCHER WITH SAGE BRUSH GRUBBING and LEVELING ATTACHMENTS

Is absolutely essential to every irrigationist who wants his land properly prepared for the most profitable results.

The 20th Century is the one *complete* tool that will grub sage brush, level the land or seed beds, make firm, smooth, narrow or wide-sided "V" shaped laterals and ditches, borders and terraces at the very minimum of expense for machine and labor.

The 20th Century is mechanically correct and guaranteed as to material, workmanship, strength and results. Price so low it will save its cost in a single season.

The 20th Century can be used successfully with two horses, and is built and guaranteed to stand up to the continuous pull of four good horses.

This machine has made good for many years. We have done the experimenting. You get the benefit.

The Baker Manufacturing Company
526 Hunter Bldg. - - - Chicago, Illinois

SUPERIOR



THE NAME TELLS A TRUE STORY

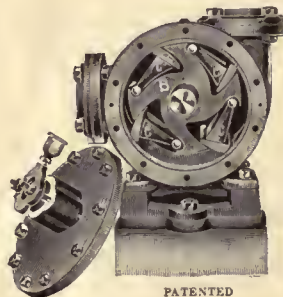
No matter where you live or what your seeding conditions are, you can get a **SUPERIOR GRAIN DRILL** that will fill the bill and do your work in the best possible manner. Superior Drills are made in all sizes and every style. Every Superior Drill is sold under a warranty that absolutely protects the buyer. Send for catalogue. Read it and go to your local dealer and insist on seeing the Superior Drill.

AMERICAN SEEDING MACHINE CO., (Inc.)
Springfield, Ohio

GRAIN DRILLS

Blackmar Rotary Pump

(Interior View)



Large Capacity with Minimum of Power

One customer writes he pumped 21,000 gallons with a fuel consumption of 1 gallon of gasoline.

Runs quiet; is high in efficiency and durability. Wear automatically taken up. Few parts, no springs, no adjustments. Requires little or no attention.

One customer has 500 in use.

Capacity, 5 to 500 gallons per min.

Tell us about your pumping problems.

Blackmar Pump Power & Manufacturing Co.
PETOSKEY, MICH., U. S. A.

Twenty-Eighth Year

THE IRRIGATION AGE

VOL. XXVIII

CHICAGO, MAY, 1913.

No. 7

THE IRRIGATION AGE

With which is Merged
The National Land and Irrigation Journal

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD
THE IRRIGATOR

D. H. ANDERSON
PUBLISHER,

30 No. Dearborn Street, CHICAGO
Old No. 112 Dearborn St.

Entered as second-class matter October 3, 1897, at the
Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

The "Primer of Hydraulics" is now ready; Price \$2.50.
If ordered in connection with subscription \$2.00.

SUBSCRIPTION PRICE

To United States Subscribers, Postage Paid, \$1.00
To Canada and Mexico, 1.50
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local banks. Send either postoffice or express money order or
Chicago or New York draft.

Official organ Federation of Tree Growing Clubs of
America. D. H. Anderson, Secretary.

Official organ of the American Irrigation Federation.
Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the
only publication in the world having an actual paid in advance
circulation among individual irrigators and large irrigation corpo-
rations. It is read regularly by all interested in this subject and has
readers in all parts of the world. The Irrigation Age is 28 years
old and is the pioneer publication of its class in the world.

Death
of
Judge
Kinney.

THE IRRIGATION AGE is exceedingly
sorry to record the death of Judge
Clesson S. Kinney of Salt Lake City,
author of "Kinney on Water Rights."
Judge Kinney has been in close
touch with this journal for many
years and has assisted its publisher at various times
with information of value to its readers, in return
for which an effort was made to aid him in his
commendable work.

Twenty years of Judge Kinney's life were spent
in the preparation of this great work, now in print,
published by a firm in San Francisco. His death
was, no doubt, a result of the arduous work encoun-
tered in its preparation.

When the writer last met Judge Kinney in Salt
Lake City, in August of last year, he was supposed
to be recovering from a prolonged and severe at-
tack of inflammatory rheumatism, and he expressed
the hope that after a month or two of rest he would
be fully recovered. He had just finished copy for
the last volume of his work, and figured on going
away for a month or two to recuperate. His death
occurred in Honolulu in February and the remains
were brought to Salt Lake City for burial.

Judge Kinney was recognized as the best

posted man in the world on the legal phase of water
rights as associated with irrigation. He was, more-
over, a wonderfully fine descriptive writer on the
history of irrigation in various countries of the
world, having made a study of the subject since his
school days.

His work, "Kinney on Water Rights," will be
a fine monument to his memory.

Portland
Turns
Congress
Down

Word comes to us that Portland,
Oregon, through the Secretary of
the Commercial Club of that city,
has turned down a proposition from
the International Irrigation Congress
to hold its 1913 session in that city,
and a letter has been sent to the secretary to that
effect.

It seems that the Board of Governors of the
International Irrigation Congress has been trying
to find a city to entertain the congress. So far as
we have been advised it has not succeeded.

It is the opinion of those who are familiar with
the situation that it would do the congress good
to let it have a year's time for reflection. Perhaps
a little leisure may bring some people to a realiza-
tion that if it has any excuse for existence it should

be something higher than to merely furnish a sinecure for officers who have demonstrated their gross incapability.

As one correspondent expresses it, "Is it not a crime, I ask you—almost seven months since the Salt Lake congress—the legislatures of the seventeen arid-land states in session all winter and now adjourned for two years—the cry heard on every hand for remedial legislation—and what has the congress done to exert its influence in behalf of better conditions? Not a thing, beyond paying the secretary's salary of \$300 per month!"

As stated in a former issue, it is the opinion of IRRIGATION AGE that this congress has outlived its usefulness and, while it may be revived by the men who held office under the old regime and derived financial benefits therefrom, it is doubtful if it will ever attain the position held during the days when such men as John Henry Smith, Judge Shurtliff, Fred J. Keisel and others of that stamp took active part.

It is doubtful if the Board of Governors will find a city that will be willing to guarantee the ten or more thousands of dollars necessary to entertain the 1913 congress.

If, however, some city should decide that it is willing to put up that amount, all of the Executive Committee, of which the writer is a member, should take firm hold and assist that city so that a good showing may be made.

Endangers Carey Act Projects

A bill was recently presented in Congress that may endanger all Carey Act projects throughout the west. The feature of the bill is that when five settlers on any Carey Act project petition the Secretary of the Interior, mentioning that the management and the state are not properly executing the laws under the Carey Act, and are not properly carrying out their contract, then the Secretary of the Interior shall cause the Carey Act company to show cause why the permit to operate under that act shall not be revoked. In other words, a petition of five persons on any Carey Act project in any state would cause the matter to come to a trial before the Secretary of the Interior and could, under certain conditions, result in a forced abandonment of the entire project.

The matter has been called to the attention of western people by Congressman Taylor of Colorado, who has sent a copy of the bill to his constituents, accompanied by a report made by a special committee on Carey Act projects.

This committee was appointed by the Secretary of the Interior and the report criticises in the most severe terms the general proposition of Carey Act projects in the west. The inference from this

report is that Carey Act ventures on the whole have been failures, and abandonment of such further projects.

Our informant states further that the report goes on to say that there are not ten thousand acres under actual cultivation as a result of Carey Act projects in the entire west. Among the reasons given in this report are:

First—Inactivity of the people in the states where Carey Act projects can be formed.

Second—Segregation of lands without funds to complete the irrigation projects.

Third—Underestimation of the cost of putting water on the land.

Fourth—Careless and inefficient state supervision.

Fifth—Insufficient water supply caused by careless surveys and estimates.

Sixth—Dishonesty of state officials.

Seventh—Failure to appreciate the distance to market the products produced.

Eighth—General lack of confidence of prospective settlers living in the east in western irrigation schemes.

It is difficult to believe that the Secretary of the Interior, who should be posted on western conditions, would permit the statement to go out that there are not ten thousand acres properly cultivated under the Carey Act in the west.

Anyone who would visit the Snake River Valley in Idaho and investigate the matter carefully, will find at least 200,000 acres that are being properly cultivated under this act, and for this reason we are inclined to question our informant, as the Secretary of the Interior or his assistants would not be likely to make so broad a statement in the face of facts with which almost everyone in the west is familiar.

There are more than that number of acres developed and in cultivation under the Carey Act in many individual counties in the west. It is safe to say that there are that number in the Big Horn Valley in Wyoming, ignoring all other sections of that state where Carey Act projects are in operation.

If Congressman Taylor, who furnished the information from which our correspondent bases his statement, will take the matter up with the Secretary of the Interior, he can very readily show him that there are that number of acres in cultivation under the Carey Act within a half day's ride from the city of Denver.

It is, therefore, impossible to conceive of a condition that would permit the Secretary of the Interior to allow a statement of this character to go forth through the newspapers or appear in connection with the bill above mentioned.

**Good
Booster
For
Wyoming**

The Basin (Wyo.) *Republican* in a recent issue contains an article and half-tone portrait of the Honorable C. F. Robertson, of Worland, Wyo., an old-time subscriber of THE IRRIGATION AGE, and a very active figure in the development of the Big Horn Basin.

As an illustration of what may be accomplished through a clear description of the western country, it may not be out of place to state here that some years ago Mr. Robertson, with whom the Editor of THE IRRIGATION AGE made a long overland trip through the Big Horn Basin, informed him that he had gotten his inspiration and developed a desire to move from Omaha farther west, from a perusal of the columns of THE IRRIGATION AGE, and that he had always felt grateful to the Editor for the suggestions this journal had given him, and for the resultant inspiration.

This is a higher compliment than would appear on its surface, in view of the fact that C. F. Robertson is a factor in the Big Horn Basin today, and was instrumental in securing capital for the building of the famous Hanover canal, which was conceived and financed by him, and which in itself is an accomplishment sufficiently worthy to enroll his name in the Wyoming hall of fame.

This canal is one of the best in the country, and during its early history obstacles were encountered that took no end of patience, perseverance and good judgment to overcome.

Mr. Robertson as manager of the concern saw that all of the difficulties were removed, and that company has today one of the very best projects in the west.

During his residence in Wyoming he has taken a great interest in the development of the city of Worland, and the Big Horn Basin at large, and this has not been a passive interest in any sense of the word. His efforts have accomplished results that would perhaps have appeared impossible to others less resolute and forceful.

Mr. Robertson is now president of the Worland Townsite Company, secretary of the leading commercial club of that city, and it was largely through his efforts that the Wyoming Plant and Seed Breeding Company, of which Prof. Buffum is the active and strongest spirit, was organized, and the location of the State Industrial Institute in the city of Worland is also due to Mr. Robertson's work.

We, therefore, feel somewhat proud of the fact that Mr. Robertson absorbed his inspiration from a perusal of the columns of THE IRRIGATION AGE, which resulted in his moving to that delightful country, where he has made good.

Mr. Robertson is an attorney at law and is

practicing in the city of Worland, and we hope some day that the citizens of Wyoming may so fully appreciate his efforts that they may elect him to their highest office, that of Governor of the state, an office he is eminently capable of filling. He is a strong Republican, but has held no public office other than that of Mayor of Worland.

**Lane
Misunderstands
Present
Laws**

Secretary Lane has under consideration a proposal that the reclaimed lands of the West be turned over to the Department of Agriculture for settlement and development, as soon as the engineering works are finished by the Reclamation Service.

At a conference held recently with Reclamation Service engineers and a Mr. Bailey of Oregon, who visited Washington to present the proposal, the Secretary was told that settlement on the reclaimed lands could be largely increased and their usefulness extended by a plan of supervision which would compel their proper cultivation in the spirit of the law.

The Secretary no doubt understands that the plan of aiding in the reclamation of lands and the matter of advising and instructing settlers under the branch of the Department of Agriculture known as the Division of Irrigation Investigation has been carried on for years. This department, it will be remembered, was in charge of Elwood Mead before his departure for Victoria, Australia, where he is now doing such excellent work for that commonwealth.

It is difficult to understand how the Secretary proposes to better conditions by turning over reclaimed lands to the department of agriculture as the disposal of these lands must lie, if we clearly comprehend the law, wholly with the Department of the Interior.

This was one of the contentions made at the time of the passage of the Reclamation Law, when it was proposed that the government turn over the work of reclaiming these lands to the Department of Agriculture.

Those opposed to that move claimed that the Department of Agriculture had no right to act in any way in the disposal of these lands and that the work should logically come under the supervision of the Department of the Interior.

After Secretary Lane has studied the situation more fully he will realize that there can be no effort made for the disposal of lands under the Reclamation Act by either his department or by the Department of Agriculture until some law is passed whereby a fund is created to advertise these lands.

Director Newell, in conversation with the Editor of IRRIGATION AGE, has stated repeatedly that there can be no law passed which will create a fund of this kind, owing to the opposition of members of Congress, particularly those of the East, who are inclined to hold down appropriations which would benefit the Reclamation Service.

As has been repeatedly urged by this publication a fund should be created whereby general advertising could be placed with the papers throughout the country and a demand thereby created for these lands.

Australia sends representatives to the United States with a large fund for advertising to induce settlers to locate in that country, and offers much better inducements than have ever been placed before prospective colonists by either the United States or Canada, notwithstanding the fact that Canada makes very liberal offers, sufficiently so as to enable her to draw over the border-line thousands of settlers who, if the same inducements could be offered by our home government, would be retained here and who, with their knowledge and money, would help develop the unoccupied tracts throughout our western country.

These facts have evidently not been brought to the attention of Secretary Lane, and it is strange that some of his advisers have failed to suggest them. Until the United States can compete with foreign countries who are making offers to settlers within our borders so much more advantageous than can be offered under our present laws, we cannot hope to compete in the matter of land settlement and development.

Investigating Salt River Project Word reaches us from Washington that Secretary Lane has decided that the Reclamation Service is not at fault in the matter of the Salt River Valley project in Arizona. The report goes on to say that for almost two months Secretary Lane has been investigating the conduct of the Reclamation Service in Washington, and in order to determine whether the course it has pursued was right or wrong he made an effort to ascertain the effect of such policies upon the people working under the projects, and in this effort he no doubt relied largely upon the advice of Reclamation Service officials in the selection of members of water users' associations throughout the west, who were called to Washington to give their views on the subject.

This it appears to us is the wrong way to go about the matter of an investigation of this character. Instead of bringing one or two hundred members of water users' associations to Washington to testify, the names of whom may have been

suggested by Reclamation Service officials in various parts of the country, the Secretary should have sent out dependable men to gather data about each project; men who had no interest in one side or the other, and whose testimony would be unquestioned.

It is not likely that an officer of a water users' association in any of the western states, who has found it necessary to work directly with Reclamation Service officials, would be inclined to go on to Washington and give testimony detrimental to the service. In fact, he could not afford to do so and at the same time protect his own interests at home.

THE IRRIGATION AGE would like very much to know who selected the names of the members of various water users' associations who were brought on to Washington, and what position they occupy in the associations, and it would also be glad to learn how close contact these gentlemen had with Reclamation Service officials.

The Secretary should understand first that the water users' associations were organized as part of the Reclamation Service. In other words, no project was developed unless an organization of this kind was perfected and the members agreed to certain stipulations laid down by the director of the Reclamation Service or his various assistant engineers. It is safe to say that there were very few men in this group of one or two hundred who criticised the actions of the service, and when the Secretary learns more about how affairs are manipulated in Washington he will no doubt finally reach the conclusion that this government of ours is one of bureau-heads rather than a government by the people through their representatives in Congress.

A man who would antagonize a bureau-head in Washington under the old regime (and very little change has been made recently) must be strongly entrenched in his home locality if he doesn't feel the effect of their lash.

If the decision in the Salt River Valley case illustrates anything of what we may expect from investigations of other projects in the future, those who are attempting to improve conditions may as well throw up their hands.

The editor of THE IRRIGATION AGE has been a life-long Democrat, and hoped for careful investigation and improvements under this administration. If we are to judge from the Secretary's decision so hastily arrived at, the future holds out no hope. We may as well sit idly by and accept what is handed to us, as was necessary during the Roosevelt-Pinchot regime.

There is no doubt but that President Wilson would like to see reforms along these lines; if, however, Secretary Lane does not secure information

from other sources than those indicated in our Washington dispatches, we will not look for any great change during this administration.

Since writing the above reports from Washington indicate that the various water users' associations are taking an active hand in national reclamation affairs, and the outlook is that there will be something of a shake-up in the Reclamation Service before they leave Washington.

Secretary Lane will no doubt learn through these men, who have evidently outgrown their fear of bureau-heads, that everything is not as smooth and clear as would appear from statements made by Reclamation Service officials.

How To Tie Knots

We are presenting in this issue an article entitled "Some Knots and Splices," by J. M. Drew of the Minnesota Agricultural College. While not directly associated with the interests represented by IRRIGATION

AGE, this article is considered of sufficient value to the thousands of ranchmen throughout the west who are readers of this periodical to warrant its publication.

We trust that our farm and ranch readers will retain this issue of THE IRRIGATION AGE, as it will be good for reference many times during the years to come.

"THE BLACK AND YELLOW TRAIL."

South Dakota, together with the states of Wyoming, Minnesota and Wisconsin, are interested in a highway extending from Chicago to the Yellowstone National Park, and to be known as the Chicago, Black Hills and Yellowstone Park Highway, with a shorter pseudonym, "The Black and Yellow Trail."

At a meeting recently held in Deadwood, S. D., at which delegates from interested cities and towns along this proposed highway were present, plans were made for beginning active work in mapping and marking this trail from Chicago to the Yellowstone National Park. It was decided to send a party over the line from Chicago to the Park. This party will in all probability leave Chicago immediately after July 4th. In the party there will be the committee appointed by the Deadwood meeting and also newspaper men and representatives of the various states and cities through which the highway passes. A photographer will also accompany the party in order to let the world have an idea of the scenic beauty, surpassing grandeur and majestic splendor to be encountered on this highway.

The tentative route as outlined by the committee is to leave Chicago going directly north along the lake shore to Milwaukee, thence westward through Madison to LaCrosse, thence north to Winona, thence west through Minnesota and South Dakota, following closely the line of the Chicago &

North-Western railway, crossing the Missouri River at Pierre, and west to and through the Black Hills, and on to Yellowstone Park. The party will travel in automobiles and make addresses at all the towns and cities en route.

Ben. M. Wood, of Rapid City, S. D., is the committeeman in charge of the arrangements, and he will be very glad to correspond with the secretaries of Commercial clubs, Automobile clubs, or Good Roads committees in the various cities and towns through which this highway passes. The promoters of this highway intend to exploit it as one of the divisions of an ocean to ocean highway having terminals on the Atlantic and Pacific coasts.

GOVERNMENT SELLS TIMBER IN SOUTHERN IDAHO.

The Department of Agriculture has begun advertising two large tracts of timber which aggregate 750,000,000 feet on the Payette river within the Boise and Payette National forests, Idaho. The District Forester at Ogden, Utah, will receive bids up to and including June 1, 1913, and for an additional month if intending purchasers wish more time to examine the timber before deciding on their bids.

While the bids received through competition will determine the rate at which the timber will be sold, the Department, as the result of a careful study, has placed a minimum price which will be considered on the timber, according to species and situation. These prices range from \$2.50 a thousand feet for western yellow pine in the most accessible places, down to \$1.00 for the least valuable and least accessible timber. The initial rates will be subject to readjustment in 1918 and in 1922. By such readjustment the stumpage price may be modified twice at four-year intervals during the twelve years which will be allowed for the removal of the timber.

The Department officials point out that, in sales of such a large quantity of timber, it is necessary to allow a long term contract because of the magnitude of operation and investment. The fact that many large sales have been made with readjustment clauses indicates, it is held, that timber operators find the method businesslike and practicable.

The timber to be cut lies on the watersheds of the south and middle forks of the Payette, and bids will be received for any or all of the timber on either fork. It is accessible to southern Idaho, which is developing rapidly and in which the demand for timber will increase.

DESTRUCTION OF ANCIENT CANALS.

In connection with the problem of keeping silt out of the irrigation canals and in cleaning the distributing system, it is interesting to note that in planning the irrigation works from the Euphrates, special attention is being given to gates at the head of the canals and arrangements such as to cut out the water entirely in time of floods and thus prevent the silt-bearing waters from entering the canals. It is stated that the heavy silt in the flood water of the Tigris and Euphrates caused the destruction of the ancient canal systems on these rivers.

UNCLE SAM PREDICTS FLOW OF IRRIGATION STREAMS.

By J. Cecil Alter,
Observer, U. S. Weather Bureau.

The third spring snow survey has just been completed by the Salt Lake City office of the U. S. Weather Bureau, in the Maple Creek watershed, a small stream from the Wasatch Mountains near Springville, Utah. The survey consists of making several hundred actual measurements in average regions of the depth, density, and water equivalent of the snow, and this year's survey reveals the reassuring fact that there is about 16 per cent more irrigation water stored in these hills than at the same time last year.

It has also been found that the compactness of the snow is practically the same as it was last year, and that the ground beneath the snow contains no frost, so that if weather conditions from the close of the survey to the end of the irrigation season average about the same as in 1912, Maple Creek should supply about one-eighth more water this season than it did last year; and from a cursory examination of adjacent watersheds, it is quite probable that the conditions in Maple watershed are an index to conditions in nearby mountains.



A typical slope, showing the omnipresent quaking aspen saplings. Though at a distance these mountains look rough and full of drifts and piles of snow, the fact is that 90% of the superficial area receives an even layer of snow which admits of easy measurement like the view here, among the mountain tops.

About four years ago the U. S. Weather Bureau saw the need for ascertaining during March of each year, the probable summer flow of certain irrigation streams so that crop choices and cultivations could be planned well in advance, and in 1911 the first survey was made of the snow layer over the Maple hills, the work being done in the last half of March.

The date of measurement, however, proved a little too late for the best utilization of the information as that was an early spring and the farmers using Maple water for irrigation purposes were plowing their fields by the time the survey was completed. The measurements in 1912 and 1913 were, therefore, made in the first half of March, and the printed report was issued to the Maple water users before any farming operations of importance had begun. Therefore every farmer had a definite and exact knowledge of the amount of snow in the hills, for comparison with exact information obtained in two years previous.

Since all presumption, hearsay and guesswork

about the water supply in the form of snow have been eliminated, these alfalfa, potato, grain and fruit farmers are making their summer plans with a fairly exact knowledge of the amount of water they will have. Moreover, should the season prove to be a very warm one, and the snow be melted with devastating rapidity a daily stream measurement at a flume above the highest farm will show the exact amount of water running away, and this can



In soft snow the only work required is putting one foot ahead of the other—on a 40% slope.

be compared from week to week with the stream flow measurements during 1912 and 1911.

The snow is about five and one-half inches deeper than last year, and shows little drifting except in the rougher portions of the watershed; and up to the close of the measurement period there had been only a few small snowslides even in these regions, thus indicating a firm condition of the under layers at that time. The streams were all comparatively low, being closed by frost and snow over the upper half of their length, approximately.

Practically the entire watershed carried a snow covering of a trace or more this year. It was also discovered that a comparatively small acreage carried as little as a trace or broken covering of snow. The density measurements, or determinations of the actual water contents of the snow by weighing, showed noticeable uniformity throughout the regions measured.

Owing largely to the impracticability of securing measurements of the snow that will be comparable from year to year in the rougher portions of the watershed and on the steeper slopes no systematic measurements were made this spring in certain limited regions. It is therefore believed that in the figures herewith presented of the snow layer over the smoother portions of the watershed, we have records that represent very closely a measure of the amount and condition of the snow that will form a basis for fairly accurate comparisons with measurements in other years.

The comparisons made in the accompanying table may be considered direct, as the averages and values for identical regions have been computed for this purpose. In comparing the 1913 and 1912 figures with the previous values obtained in 1911, however, it will not be forgotten that these last-named figures were obtained two weeks later in the season.

The snow measurement work inaugurated by the Weather Bureau is now being done by the citizens of some mountain streams in the San Pete Valley of Utah, and by the Provo Reservoir and Irrigation Company near Provo. This company not only furnishes water on contract but supplies light and power on contract by the year, as well, and if it discovers early in the spring that there will be an excess of water the company can undertake much larger contracts. Snow studies for similar purposes are made in scattered regions of southern Idaho and northern Utah by the engineers of the Utah Power & Light Company. The government aims to supply the equipment in all cases of snow surveys, and it is only for lack of funds that it does not actually perform the work on every watershed where a stream flow forecast would be valuable.

Mr. Alfred H. Thiessen, in charge of the Salt Lake City office of the U. S. Weather Bureau, who also has charge of the snow survey work in Utah, plans a co-operation with every water company in the state with the end in view that the government shall supply all instruments, and possibly send experts to show the farmers and engineers how the work is done, and to publish and distribute from Salt Lake City, all information obtained in this way.



A measurement among the quaking aspen trees. Depth 39.0 inches; water equivalent 12.2 inches.

It has been proven that the cost should be comparatively small, as the labor in most cases should be supplied by men in the employ of the water companies who are not doing other work at this time of the year. And where most of the company are farmers, the work may be done by volunteers, as it has been done already at Moroni, Utah.



The Marvin Snow Density Apparatus.

Snow sampling tube $2\frac{1}{2} \times 50$ inches, containing the snow core, or sample (note its protrusion), is weighed on a spring balance scales swing from an alpen-stock, thrust into the snow. The scale is graduated to show the water equivalent of the contents of the tube.

In this way, with the instruments furnished by the government; and the computing, publishing and distributing of the information being also done, promptly, from the Salt Lake City office, there need be no actual expense to the water users for the work. And as has already been demonstrated, a week's work in the headwaters of a well-used stream, by two snow measurers, may be worth many thousands of dollars to the community at the foot of the mountains.

Comparative summaries of Maple Creek snow measurements made during the past three years:

Branches of Watershed.	Year.	Month and date.	No. of Meas.	Aver. depth of snow, ins.	Aver. amt. of water in snow, ins.	Per Cent. of density.
Perry and Squaw hollows	1911	March 22	18	23.1	7.4	32
	1912	March 5	36	37.2	9.6	26
	1913	March 6	36	41.9	9.9	24
Tuckett hollow	1911	March 23	27	35.3	11.8	33
	1912	March 6	29	46.2	13.0	28
	1913	March 7	38	48.0	11.6	24
Left hand fork and all its south and southwest branches	1911	March 24, 25	76	36.7	10.1	28
	1912	March 8, 9	66	46.8	10.2	22
	1913	March 9, 10	94	51.7	12.8	25
Dibble fork and its left hand branch	1911	March 26, 27	65	38.7	13.4	35
	1912	March 8, 9	91	45.6	11.5	25
	1913	March 10, 11, 15, 16	85	50.8	12.7	25
Main maple canyon and Van Lewen hollow	1911	March 27	9	27.3	8.3	30
	1912	March 11, 13	44	29.6	6.4	22
	1913	March 12, 13	28	32.9	8.3	25
Summary entire region	1911	March, last half	195	35.4	10.8	31
	1912	March, first half	266	42.2	10.2	24
	1913	March, first half	281	47.8	11.8	25

This should result in surveys being made in fifty instead of a half dozen watersheds, and from this many actual measurements made simultaneously, estimates for intervening watersheds (not measured) could be made.



SOME KNOTS AND SPLICES.

By J. M. Drew, Minnesota College of Agriculture.

The purpose of this article is to illustrate methods of making a few of the most useful knots and splices. No attempt has been made to show all the knots known to the sailor, or even to list them, but rather to select a few of the most useful and show the simplest and easiest way to make them. It is the hope of the author that the illustrations and brief description of each knot and splice will enable the beginner in the art to easily master them.

Rope.

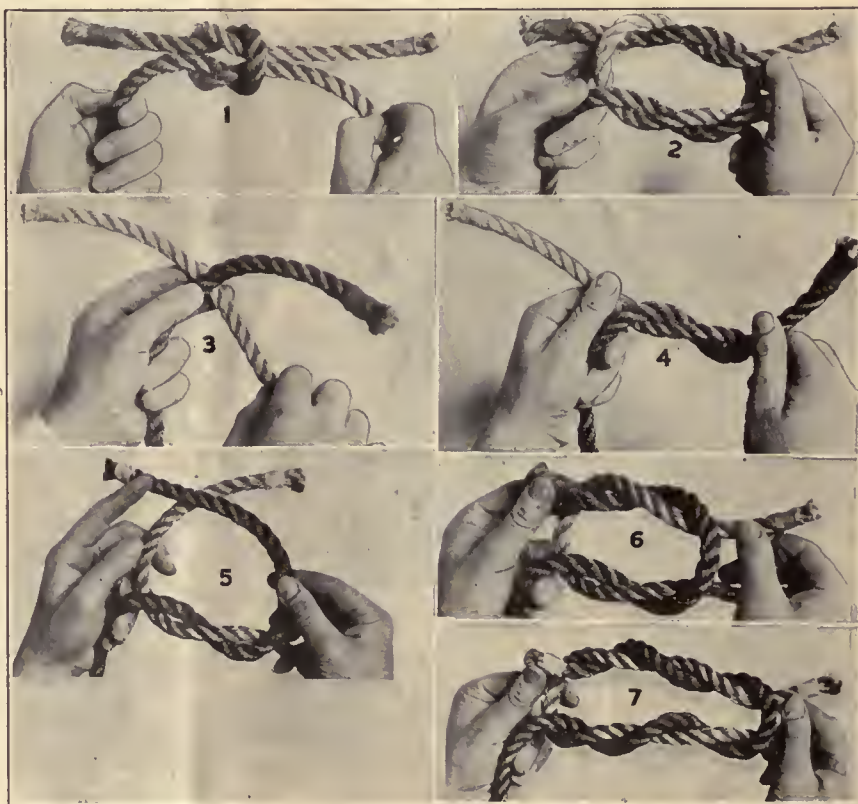
The most common materials for rope making are Manila and sisal.

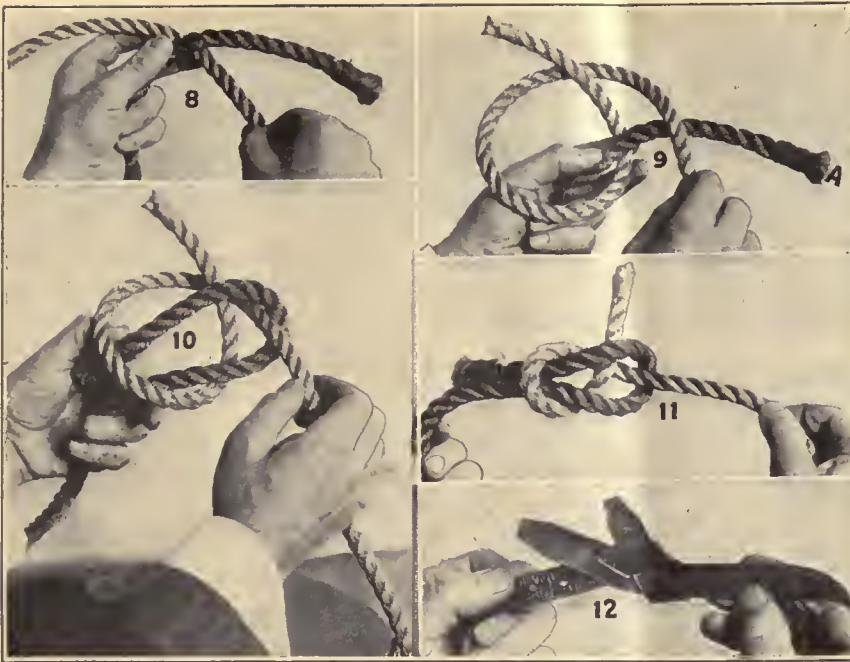
Manila fiber, often called Manila hemp, is obtained from the leaf and leaf sheath of a kind of a banana palm native in the Philippines. There are several varieties, but all are known by the general name of abaca. The plants grow from eight to twenty feet high and the leaf sheaths are from five to twelve feet in length. These are cut into thin strips, and the pulp scraped away by drawing the strips under a knife held by a spring against a block of wood. After drying in the sun, the fiber is tied in bundles and taken to the market towns to be baled. The average yield is reported to be 650 pounds per acre. The average price of the fiber in New York varies from four to fourteen cents per pound.

Manila fiber forms over 60 per cent of the value of the exports from the Philippine Islands, and furnishes material for the best grade of binder twine. Owing to its great strength, it can be made to run 650 feet to the pound, as compared with 500 feet in the case of sisal.

The sisal plant, known as hen-

equin in all Spanish speaking countries, is a native of Yucatan. It is a plant somewhat resembling the century plant and is propagated by suckers springing from the roots of the old plants, or by sets like onion sets which grow on the flower stalks. The fiber is found in the leaves and is separated by scraping and washing. The average crop yields about 600 pounds per acre. The price varies from $2\frac{3}{4}$ to 10 cents per pound in the New York market. The fiber is from $2\frac{1}{2}$ to 4 feet in length and stands next to Manila in strength. It is much harsher and stiffer than Manila, and is used very largely in mixtures with Manila fiber in making binder twine and rope.





Tar Weakens Rope.

Rope is often tarred to protect it from the weather. This is a somewhat doubtful practice as the acid in the tar weakens the rope to such an extent that engineers estimate tarred rope to be only two-thirds as strong as clean, new rope.

No kind of oil or other preparation has so far been found that will not injure the rope, except tallow. Tallow and graphite are used in making transmission rope, and for lubricating it when in use.

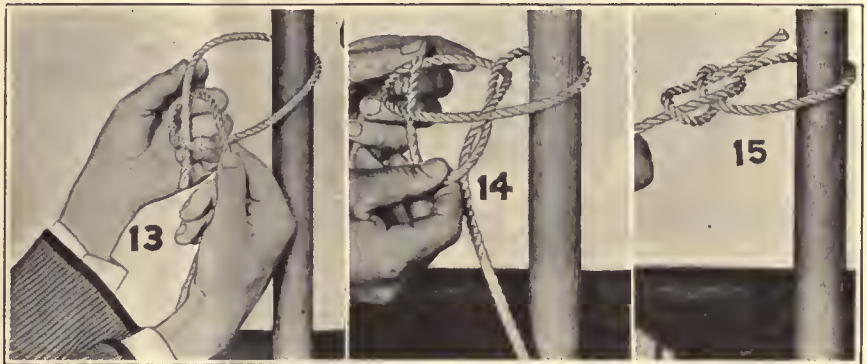
Taking New Rope From a Coil.

The proper way to take rope from a coil is to draw it from the middle. There are two ways to do this—a right and a wrong way. If it happens to be done the wrong way the rope will become twisted in a manner that will make it almost unmanageable. If done the right way it will come out without any twisting or snarling and all the rope in the coil may be drawn out without trouble. To do it properly the rope should be uncoiled toward the left, or opposite the

way the hands of a watch or clock run. By finding the inside end of the coil and observing how it uncoils, one may tell whether or not he is starting in the right way. If the rope uncoils to the right instead of the left the whole coil should be turned over and the end pulled through from the opposite side of the coil. The rope will then uncoil to the left and cause no trouble.

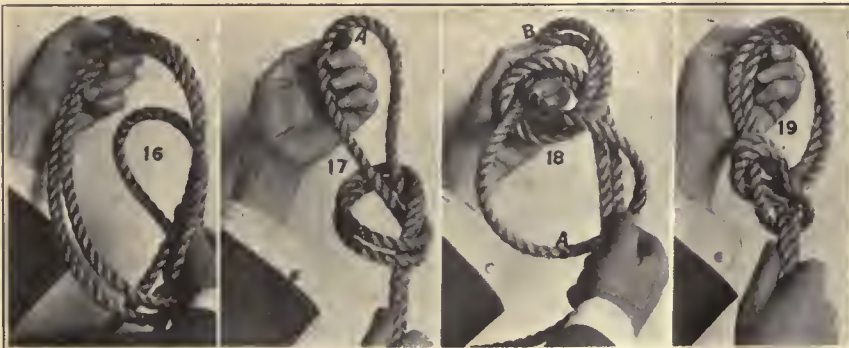
New, Stiff Rope.

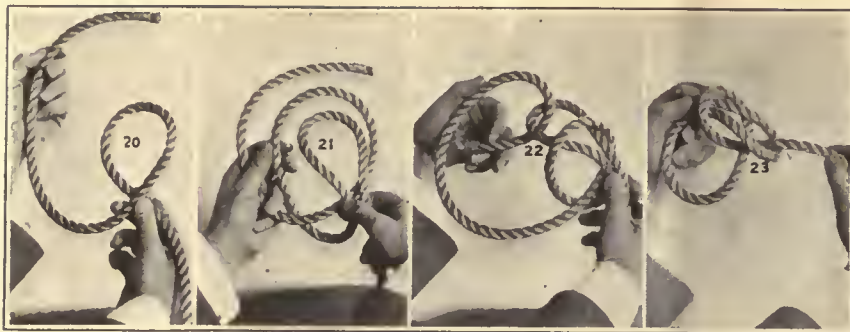
A new rope, particularly if it be sisal, often causes trouble because of its stiffness. If used as a hay fork rope, or in any place where it runs through a set of pulleys, it is apt to be troublesome until it has been used for some time. This trouble may be avoided by boiling the rope in water. The plan usually used is to coil the rope in a boiler or large soap kettle and cover with water and bring to boiling heat. The rope is then stretched out and allowed to dry, when it will be found to be soft and pliable. Manila rope is usually soft enough to use without such treatment.



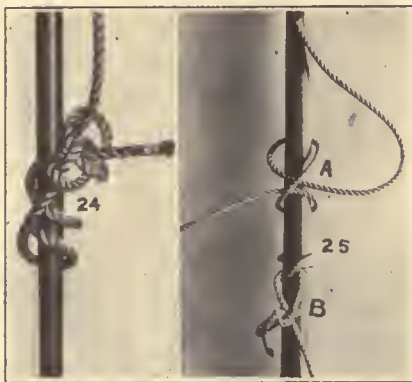
Knots.

The square knot shown in Figure 1 is also known to sailors as the reef knot, because it is used in reefing or shortening sail. It is very commonly used in tying two ropes together, and in tying up packages. Figure 2 shows the granny knot which is often made in the effort to tie a square knot. Notice the difference between them. In the square knot the parts of each rope lie parallel to each other where they pass through the loop in the opposite rope. In the granny knot these parts cross each other. The granny knot is easily pulled apart unless drawn up very tightly; and then it is apt to become so tight and hard ("jammed," the sailors say), that it is almost impossible to untie it.





The proper way to form the square knot is to do all the tying with one end. Figure 3 shows how to start it by placing the left-hand end on top of the right-hand rope. This left-hand end is then turned around the main part of the right-hand rope as in Figure 4, then kept going in the same direction around the right-hand end which has been bent over as in Figure 5. Figure 6 shows the knot before it is pulled up tight. Notice that the end and standing part of each rope lie parallel with each other



through the loop of the opposite rope. Figure 1 shows the finished knot.

A modification of the square knot known as the surgeon's knot is often used in tying up packages. The end used in tying is passed twice around the other rope instead of once, as in the square knot, then twice around the other end as shown in Figure 7. In tying up a package, pass the end around the other cord twice and then pull both ends sidewise. This will keep the cord from slipping and do away with the necessity of holding the first half of the knot with the finger while making the second half.

The weaver's knot is used in tying two ropes, strings, or straps together. To learn to tie it in the quickest way, place the left-hand end over the right-hand end as in Figure 8, and hold it there with the left thumb; then loop the standing part of the right-hand rope around its own end as shown

in Figure 9. Next put the end of the left-hand rope A in Figure 9 down through the loop beside the left thumb and take hold of it as in Figure 10. To finish the knot pull on the main part (not the end) of the right-hand rope and the result will be as shown in Figure 11. After a little practice a person will be able to tie this knot more quickly than the square knot. It is not so likely to become jammed too tight to untie

as is the square knot. It is the best knot for tying together two leather straps, as, for instance, in case the lines have to be tied together in hitching up a four-horse team. Figure 12 is a modification of the weaver's knot which is often made use of in uniting two straps. A slit is cut in the end of one strap and the other end is passed through the slit and around the strap and under itself.

The bowline is one of the most useful of all knots. It will not slip, and it never becomes jammed. There are several ways of tying this, but one of the easiest ways is shown in Figures 13, 14 and 15. The end of the rope is placed around some object and an over-hand loop or turn is made in the main or standing part, as the sailors call it, of the rope. The end is then passed down through the loop, as in Figure 13, around the standing part of the rope and up through the loop as in Figure 14, so that the two parts passing through the loop lie parallel to each other. Figure 15 shows the completed knot. No matter how much strain is put upon the rope it will always be easy to untie.

The double bowline, or bowline on a bight, is used when it is desirable to hitch to any other part of a rope than the end. To make this, take a loop of the rope and tie a loose over-hand knot as in

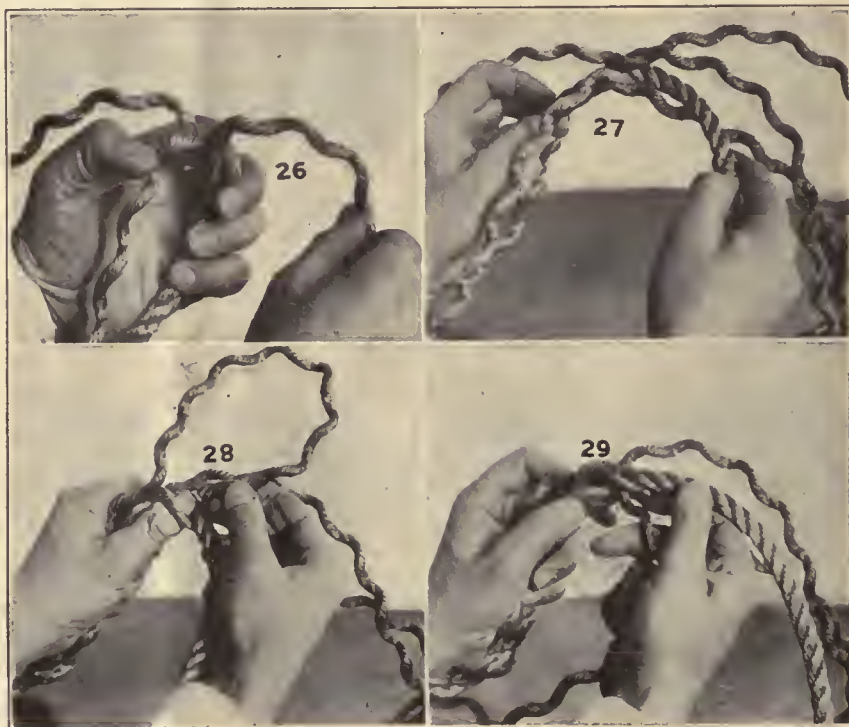


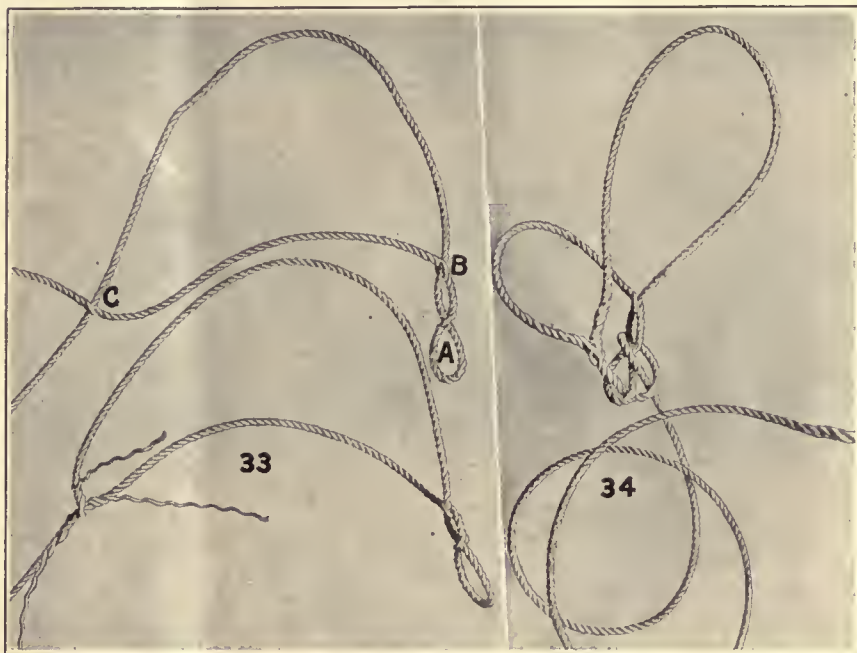


Figure 16. Next pass the loop A in Figure 17 backward over the loose knot as in Figure 18. Now take hold of the part at B, Figure 18, and pull into the shape shown at Figure 19. This knot has all the good qualities of the single bowline and is very easily and quickly made.

What is known as the Texas method of tying a bowline knot is shown in Figures 20-23. A loop is first made as in Figure 20 and a bight of the standing part of the rope is pushed through this loop as in Figure 21. The end of the rope is then run through the bight and doubled back upon itself and held tightly with the left hand while the standing part of the rope is pulled, producing the result shown in Figure 23.

The lifting hitch, shown in Figure 24, is used in pulling a pump or pipe out of a well or wherever it is necessary to pull lengthwise on any smooth object. It is made by forming a loop or noose in the end of the rope, then wrapping the end of the rope several times around the object to be lifted (going in the opposite direction from the way the pull is to be exerted), then putting the other end of the rope through the loop.

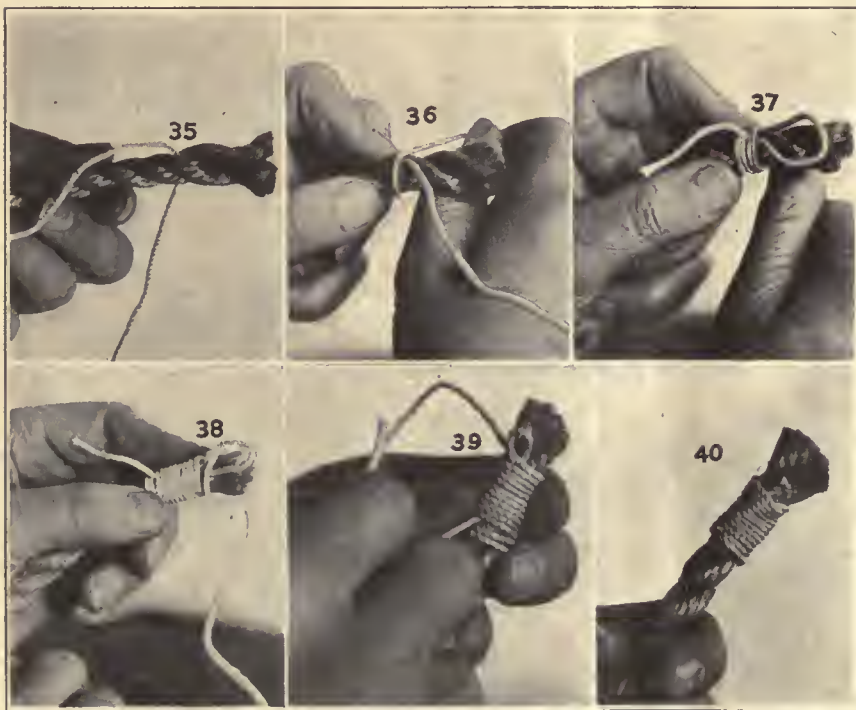
used in climbing a pole or mast. By using two ropes, one for each foot, a person can make a pair of climbers by the use of which any smooth pole

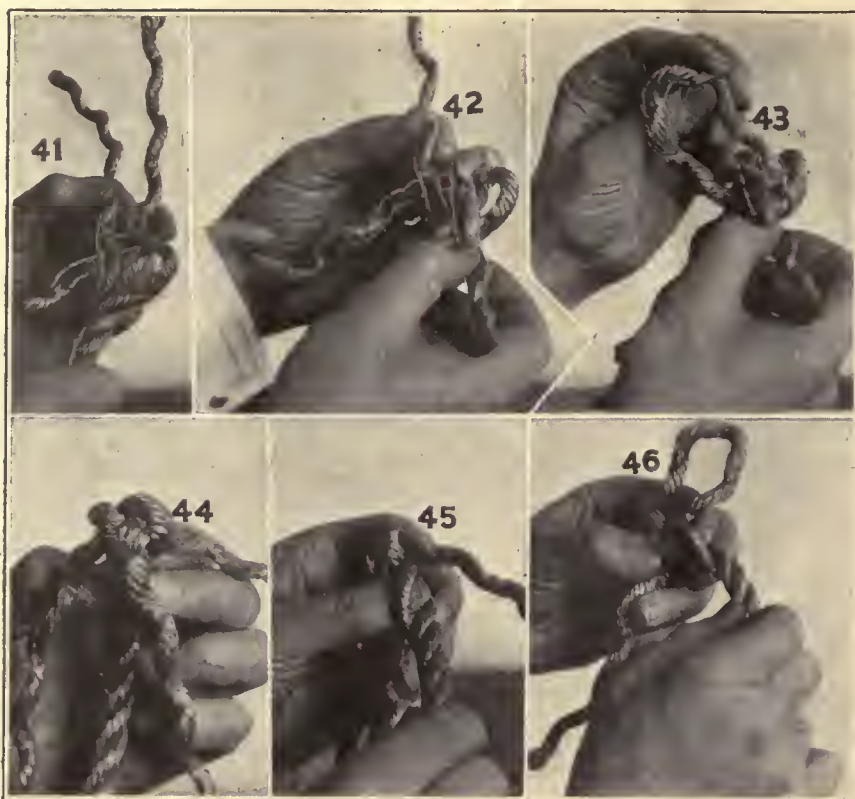


or tree may be climbed in safety.

The clove hitch (Figure 25) is the knot used by the tent man in fastening the tent ropes to the stakes, by the miller in tying sacks, by the cowboy in tying his lasso to the saddle horn. It is a very useful knot in many situations and every farmer boy should know how to tie it. It is a good knot to use in case a horse is hitched to a pole, pipe, or post which has no ring to keep the rope or strap from slipping down. It is tied by placing the end around the post under the standing part of the rope, around again and under itself, as shown in Figure 25, A. If pulled up tightly and then the ordinary halter knot tied in addition to it, as shown in Figure 25, B, the rope cannot slip down so the horse can get his foot over it, as so often happens when the ordinary halter knot alone is tied.

A short splice may be made in several ways. The way here illustrated is considered the best as well as the easiest. To make a





good short splice requires that the rope be unlaid for about twenty-five times its own diameter for each end of the splice. Care should be taken that the ends of the strands are opened up properly so that none cross over the middle as in Figure 26.



The middles of the two ends are then placed together so that each strand lies between two strands from the opposite rope, as in Figure 27.

After the ends are set together in this way, begin the splice by taking a strand from the left-hand rope and placing it around the strand from the right-hand rope which lies against it on the farther side from the operator. Place it around and pull it under, toward you, the same as though you were tying the first half of a square knot. The easiest way to do this is illustrated in Figure 28. Here the rope is untwisted enough to allow the left thumb to go under the strand from the right-hand rope so that the strand from the left-hand rope may be placed

against the end of the thumb and crowded under the right-hand strand as the thumb is drawn back.

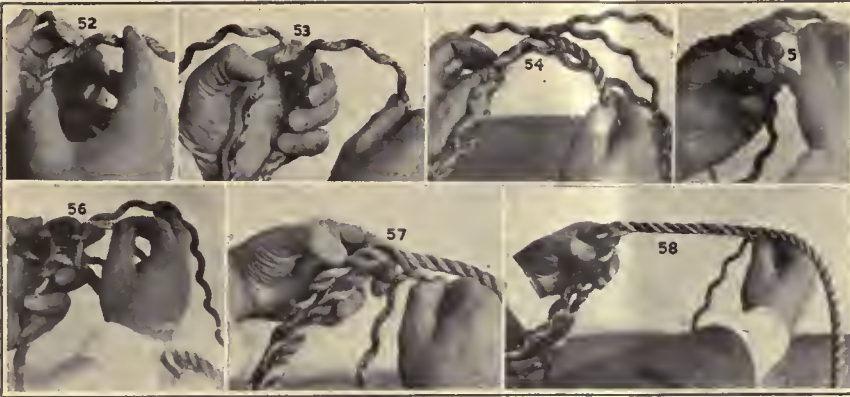
After this is done and the strand pulled down smoothly as in Figure 29, turn the rope toward you and do exactly the same with the next pair of strands; that is, place the one from the left-hand rope around the one from the right-hand rope which lies next back of it, and pull it under toward you. Do exactly the same thing with the third strand from the left-hand rope; then reverse the rope, or place yourself on the other side of it, and go through exactly the same process with the other three strands. All strands should now be pulled up tightly and if all the operations so far have been correctly done, the middle of the splice will be a three-strand rope the same as any other part of the rope as shown in Figure 30, only that the strands will be twice as large as in the original rope.

To finish the splice simply keep repeating the process already begun except that as you proceed, leave out a small portion of each strand each time it is looped around its mate, thus gradually tapering the end of the splice as in Figure 31. This kind of short splice will be smoother when finished and will wear longer than the ordinary short splice in which the strands cross each other nearly at right angles. Figure 32 shows the completed splice.

Rope halters are very easily made, cost very much less than those made of leather, and for some purposes they are much better. For example, a colt when first tied in the stable, will be very much less likely to learn the bad habit of halter-pulling if tied with a rope halter which will hurt the back of his head when he pulls upon it, than he will in case a leather halter is used.

To make a good halter for a horse requires about 15 feet of half-inch rope. To measure the rope for the halter, allow about six inches of the end for splicing, then measure from the point at the side of the head where the square ring of a leather halter naturally comes, over the head to the corre-





splicing point on the other side, then back to the middle of the under jaw. Mark the rope at this point, by binding it upon itself, and about three inches from this point, on the long part of the rope, raise one of the strands and run the short end through so as to join an eye as shown at A, in Figure 33.

About three inches farther along on the long part of the rope (B, in Figure 33), raise another strand and put the short end through again. Next place the part B at the point at the side of the face, where the square ring of a leather halter would be, and measure with the long part of the rope around the nose to the point just opposite B (C in Figure 33), and, opening up the rope, run the short end through for a distance of six inches. Next separate the strands of this six-inch end and splice one into the head piece, one into the nose piece and one into the long end. Do this splicing after the manner shown in the description of the short splice, gradually thinning out each strand as the splicing proceeds, so as to make it taper off nicely.

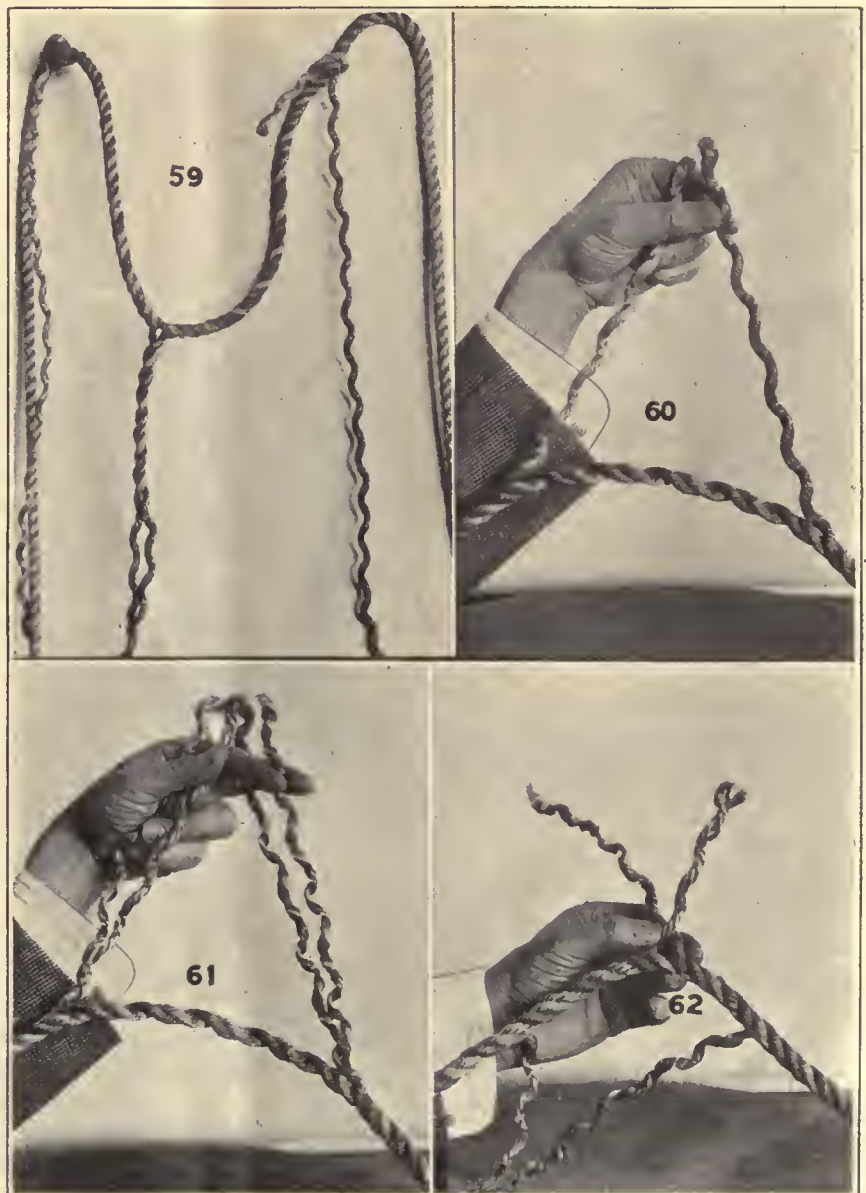
The halter is now to be completed by running the long end through the loop A, in Figure 33, and tying as shown in Figure 34.

A whipped end is used to finish the end of a halter or other rope, so that it will not ravel, and at the same time have it practically the same size as the original rope, it may be wrapped with a small cord as shown in Figures 35-40. The cord is started around one strand as in Figure 35, and then wound around as shown in Figure 36. After a few turns the short end is doubled back to form a loop as in Figure 37, and the winding continued to near the end. The long end is then passed through the loop and drawn down under the whipping by a pull on the short end. Both ends are

then cut off close, leaving the result shown in Figure 40.

The spliced end furnishes another very good way to finish a rope end by splicing the end back upon itself after the manner of the short splice. To begin, bend one strand over between the other two as in Figure 41, then bend the next strand over the end of the first and the third over the end of the second and under the loop of the first as shown in the cuts. Each end is then spliced around a strand exactly as in making a short splice. The ends are thinned out as the work progresses and the completed end looks like Figure 48.

The halter hitch, a good knot for tying a horse or other animal, is illustrated by Figures 49-51. The rope is first placed around the hitching post so that the end is at the right hand. The end is then placed around the standing part, back of the left hand, as





shown in Figure 49, then around the standing part again in front of the hand as shown in Figures 50-51. The end is then drawn up so as to make the knot firm. It is important that the end be drawn up tight before pulling up the standing part; for if the standing part be pulled straight before drawing up on the end, a slip knot is formed instead of the hitch as shown in the cut. After a person becomes used to tying this knot it is tied as easily and quickly as the ordinary halter knot and is better, for the reason that it is not so apt to become jammed and hard to untie.

The long splice requires that about one hundred times the diameter of the rope be used; in other words, each end to be spliced must be unlayed for a distance equal to fifty times the thickness of the rope. After this unlaying is done, the first step is to place the ends together in such a way that each strand lies between two strands from the opposite rope. Before doing this, however, one should be sure that the rope is opened up properly, as shown in Figure 52. If one strand is crossed over the middle of the rope as shown in Figure 53, which often happens, unless the operator is very careful, the splice cannot be properly finished. When the ends are properly set together as in Figure 54, two pairs of strands from opposite ropes are twisted together. This twisting is not a part of the splicing proper, but is done simply to hold the middles of the ropes together and to avoid confusing the strands. The proper way to twist them together is to take any strand from the left-hand rope and twist it together with the strand from the right-hand rope which lies next back of it, or away from the operator. This is shown plainly in Figure 55. The left-hand strand is twisted to the right as though the operator were trying to wring water out of it and laid against the strand from the right-hand rope. This latter strand is then twisted in a like manner and laid against the first one, and this operation repeated four or five times. These strands in trying to untwist will naturally wind themselves together. A second pair is then

twisted in like manner as shown in Figure 56.

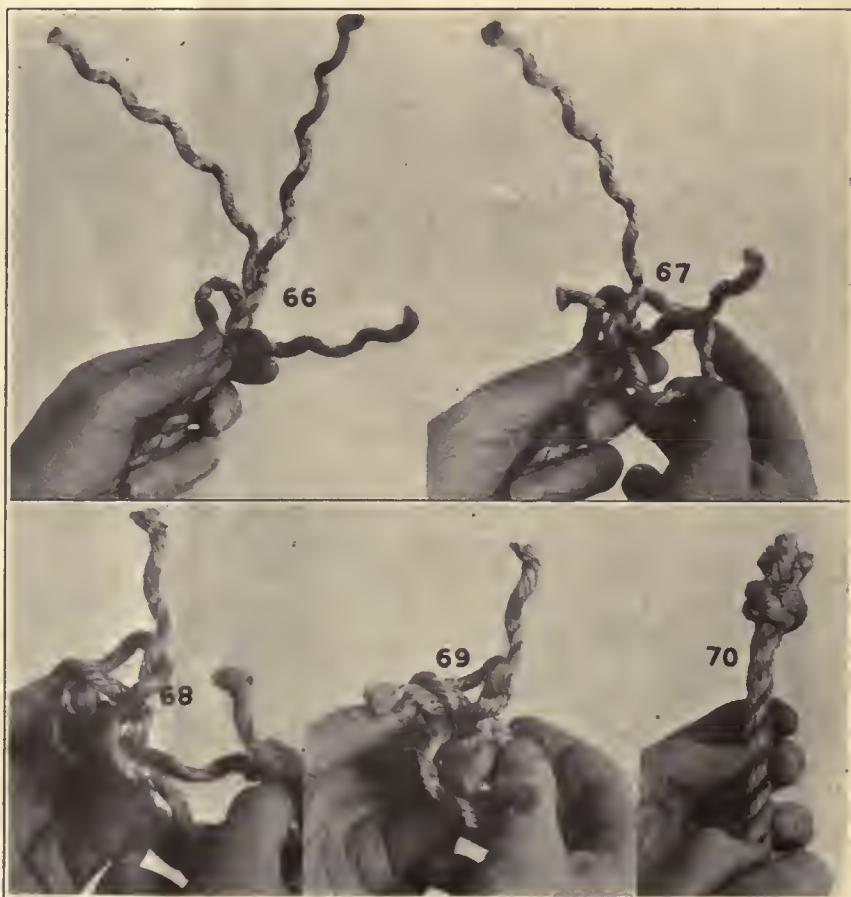
We are now ready to proceed with the splicing, which is done by taking the remaining loose strand from the right-hand rope and unlaying it one turn at a time and laying the corresponding loose strand from the left-hand rope in its place, twisting it the same as it was twisted in the original rope as in Figure 57. This process is repeated until the

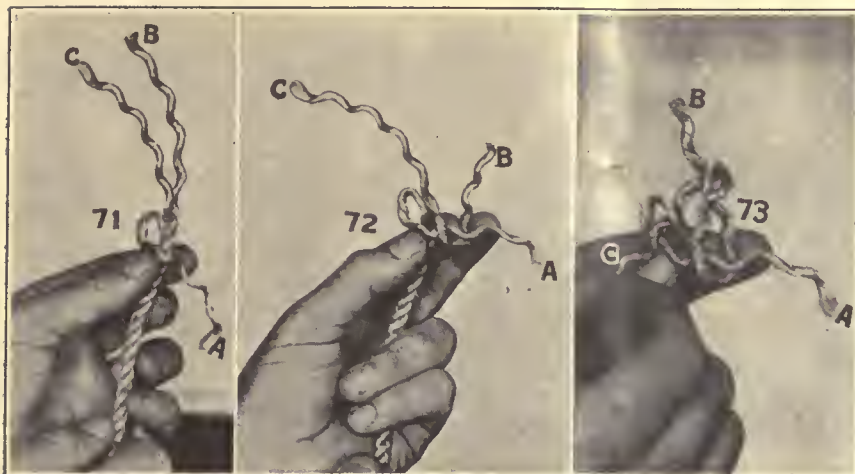
strand from the left-hand rope is nearly used up.

If the directions given above are followed closely and the strand from the left-hand rope is twisted as it should be as it is laid in the place of the other strand, this part of the rope will look exactly like the original rope, as may be seen in Figure 58.

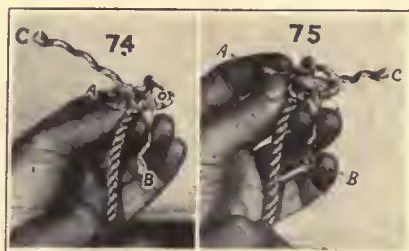
When only a few inches of the left-hand strand are left, make a half hitch around the rope to keep it from raveling out any farther and go back to the middle of the splice, and untwisting one of the other pairs of strands proceed to splice in the opposite direction, going through the same process as with the first pair of strands. After doing this you should have something that looks like Figure 59, which shows the three pairs of ends ready to be finished off.

The finishing process may be carried out in one of two different ways, depending upon the result desired. In the case of a new rope which is to be used for a belt or in some other place where it





is necessary that it be left exactly the same size as the original rope, all three pairs of ends should be finished as follows. Each end should be unlaid about three turns as shown in Figure 60, then split in halves as shown in Figure 61, then a half of each one should be laid back the three turns where the whole strand came from as in Figure 62, and where they come together should be tied one around the other the same as in the first half of a square knot, shown in Figure 63. The same is shown pulled down in place in Figure 64.



Each end is then tucked around and around the other half strand until the place is reached where the strand was split in half, when all loose ends may be trimmed off. It is a good plan not to trim these ends too short for fear that when a heavy strain is put upon the rope they may be pulled through. They should be left extending out about one diameter of the rope.

This method of finishing leaves the splice exactly the same size as the original rope, but weakens the rope somewhat. In the case of an old rope or in the case of a hayfork or other rope which may as well be a trifle larger than the original rope, it is best to finish the ends by placing one whole strand around the other as in Figure 65, instead of unlaid and splitting them as described above. After placing one strand around the other as shown in Figure 65, and pulling them down tightly, continue placing one strand around the other for several turns, then thin out in exactly the same manner as described for the short splice. This

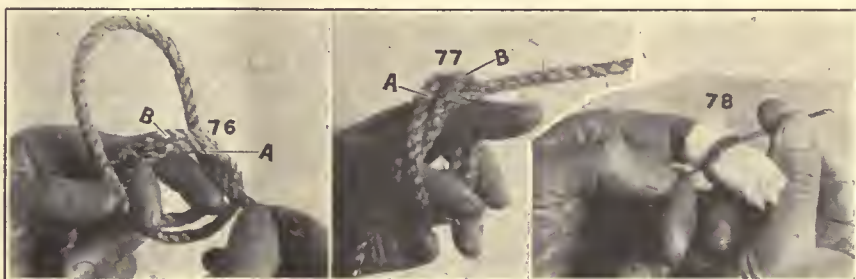
will leave the rope only a trifle larger than the original and somewhat stronger.

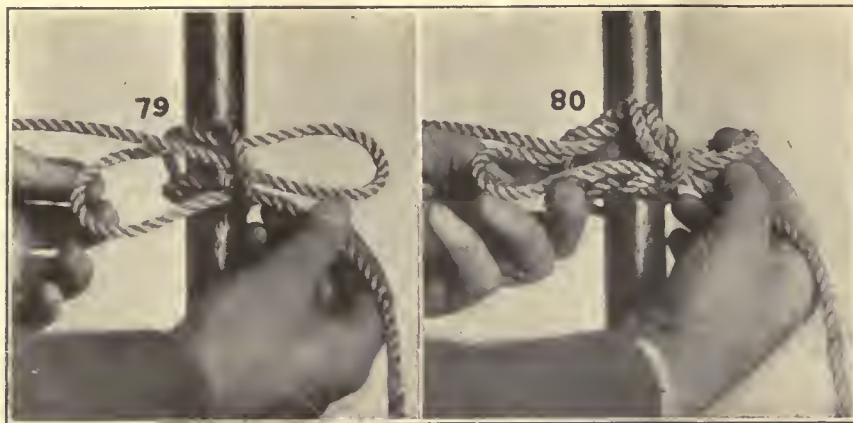
The Walker knot is used where it is desirable to have a rather large, round knot in the end of a rope. Figures 66-70 show how it is formed. The strands are first separated for five or six inches and one strand is turned down against the rope and held with the thumb as shown in Figure 66. The next strand to the right of the one first used is then looped around the end of the first strand and the end of it put through the loop in the first strand as in Figure 67. The third

strand is then put around under both the other strands and brought up next to the main part of the rope through the loops formed in the first two strands. This is shown in Figures 68 and 69. In Figure 68 the end of the strand held in the right-hand is brought up through the place occupied by the end of the forefinger of the left hand. Figure 69 shows this strand just as it is pushed through the place mentioned. The knot is next pulled up tight by pulling a little on each strand until all are drawn up tight. This pulling of the strands should be done at right angles to the rope instead of endwise. After it is pulled up tight, the loops are rolled toward the end of the rope so that the strands all appear to come out from the middle of the end. Figure 70 shows the knot completed.

The wall knot and crown are often used when a rather small knot in the end of a rope is desired. Figures 71-73 show clearly how it is made, while Figures 74 and 75 show how it is crowned.

To form this knot the end of the rope is unlaid three or four inches and one strand, marked A, in Figure 71, is laid down against the rope in such a way as to form a loop, and held with the left thumb. The next strand, marked B, in the cut, is then bent around the end of strand A and held between the ends of the first and second fingers as shown in Figure 72. Strand C is then bent around the end of B and through the loop in the first strand as shown in Figure 73. The three ends are now to be pulled till the knot is solid. To put the crown on the knot, lay one strand (A, in Figure 74) down, so as to form the loop O, then lay strand B down across this loop and hold it as shown. Next bend C over B and put it through the loop O, and pull all the ends tight.

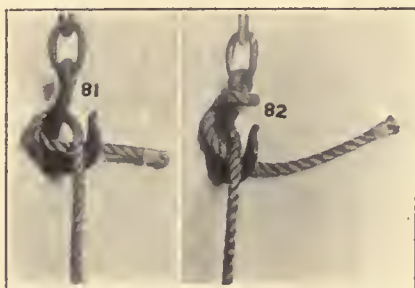




The first aid knot is illustrated in Figures 76-78. It is a very convenient method of fastening a bandage on a wounded finger when a person must do so without assistance. In Figures 76 and 77 a piece of small rope is used so as to better illustrate the method of forming the knot. A piece of small twine or thread may be used in exactly the same way.

To form the knot, make two round turns over the fingers as shown in Figure 76, and draw the end through these two loops, then take the loop A, lift it up, and place it over on the other side of B, as in Figure 77. The knot is now ready to slip over the bandage as in Figure 78. Simply pulling on the two ends till the right degree of tightness is attained is all that is necessary, as the part A crossing the other parts where it does, holds them in place and no further tying is required.

The safety bow knot takes but a second longer than the ordinary knot in tying, and if properly tied and pulled taut, will stay as long as desired. The ordinary bow-knot as generally tied in a shoe-string frequently becomes untied at times when the owner prefers to have it stay tied. The safety feature is added by simply making a double turn with the bows at the finish of the knot instead of a single turn. It will be noticed that this is very similar to the finish of the surgeon's knot illustrated on a previous page. In Figures 79 and 80 a piece of rope is used instead of a shoe string, be-



cause the method of tying is much easier to show in this way. Figure 79 illustrates the method of tying the ordinary bowknot. Figure 80 shows the loop doubled under again to form the safety feature. This knot may be loosened by pulling the ends of the string the same as the ordinary bowknot, but a harder pull is required.

The Blackwall hitch, illustrated in Figure 81, is a simple way to fasten a rope to a hook or to the

crotch of a tree or limb without tying a knot. It will hold any strain that the rope will withstand as long as the rope is kept taut, but may be easily shaken loose when the strain is removed. It is often convenient in cases where it is desirable to use a rope in descending from a tree, or other high place. If fastened with this hitch, the rope may be loosened by simply shaking it vigorously. Figure 82 shows what is sometimes called the double Blackwall hitch. It is a little less likely to slip when used on a big hook.

GROWING THE BLACK LOCUST IN SOUTHERN IDAHO.

By Herbert Shearer.

It is not generally well known that the black locust thrives in southern Idaho. Some one tried it on a high altitude and the impression got out that it is too tender to stand the winters. A few groves, however, have done so well that the tendency now is to plant black locust instead of the poplars, and other soft woods that have heretofore been planted as wind breaks and shade trees.

Paul S. A. Bickle has five acres in black locust, which were planted in 1907. His trees cost \$12.00 per acre, and Mr. Bickle estimates that the planting cost \$12.00 per acre. They were set four feet by five feet, and irrigated by furrows between the rows. Mr. Bickle tells me that he could cut this year and sell \$50.00 worth of posts from each acre.

A post contains about seven feet broad measure and is worth twenty cents. They grow again from the stump, so he thinks he can cut fifty dollars' worth of posts per acre each year from now on. In addition to this return he has had considerable pasture between the trees. So far he does not consider that the land has been given up to the growth of timber exclusively, because the value of the pasture has gone a long way towards paying interest on the investment.

H. L. Hollister expects to use a good many black locust trees for wind breaks and for wood lots on his land near Jerome.

Senator Fred W. Hastings, who has a farm adjoining the town of Wendell on the north, has a very interesting grove of black locust trees planted four years ago. Senator Hastings has had no trouble from frost and does not anticipate any, but says he is careful not to irrigate too late in the season, as he is particular to have the new wood well ripened before winter.

Black locust trees planted two or three rows together will make a very satisfactory windbreak in about three years. Many of the trees will measure five inches through at the stump the fifth year. In fact, it is estimated that the growth will average about an inch a year.

The black locust in Idaho is free from insects and has proved to be frost-hardy, except in the higher altitudes.

Supreme Court Decisions Irrigation Cases

WELL DRILLING CONTRACT.

When a well driller, under contract to drill a well until he found water or receive no pay, stopped before finding water in appreciable quantities, he could not recover for his work. *Turner v. Hartsell*. Court of Appeals of Alabama. 58 Southern 950.

ECONOMICAL DIVERSION.

A prior appropriator of water for irrigation did not employ a reasonable and economical method of diverting it where he permitted two-thirds of the water diverted to become lost in a swamp without any good excuse therefor. *Doherty v. Pratt*. Supreme Court of Nevada. 124 Pacific 574.

RIGHTS OF COUNTIES IN WATER.

A county could, by 10 years' prescriptive use of water from springs in a highway for the maintenance of a water trough, acquire a right as against the owner of the fee to have such water. *Kiser v. Douglas County*. Supreme Court of Washington, 126 Pacific 622.

CONVEYANCE OF WATER RIGHTS.

A water right is real estate, and must be conveyed as real estate; and, where one has a valid water permit issued to him by the state engineer, he cannot convey the water right secured thereby by simply handing the permit to a would-be purchaser. *Gard v. Thompson*. Supreme Court of Idaho. 123 Pacific 497.

SUBTERRANEAN WATERS.

Subterranean or percolating water is not governed by the rules applicable to running streams, but the proprietor of the soil where such water is found may control and use it as he pleases to improve his own land, though his use or control may incidentally injure an adjoining proprietor. *Ryan v. Quinlan*. Supreme Court of Montana. 124 Pacific 512.

APPROPRIATION.

The current of a river cannot be appropriated by a riparian proprietor in Idaho to the extent necessary to operate the water wheels used by him to divert the water actually appropriated for a beneficial use, so as to give him a right of action for the destruction of the current by subsequent appropriators, when exercising their right, under Idaho Const. art. 15, § 3, to apply the unused water to beneficial uses,—even assuming the coexistence in that state of a system of riparian rights and the doctrine of appropriation. *Schodde v. Twin Falls Land & Water Co.* Supreme Court of the United States. 32 Sup. Ct. Rep. 470.

LIABILITY OF IRRIGATION COMPANY.

Under Irrigation Act 1895 (Acts 24th Leg. c. 21), § 11, as amended by Acts 24th Leg. c. 23, providing that in case of shortage of water from drought or accident it shall be distributed pro rata and without preference, a failure by an irrigation company to furnish a customer sufficient water to raise a full crop on a stipulated number of acres according to contract will not subject the company to damages if compliance therewith would, on account of shortage of water from such causes, deprive other customers of

(Continued on page 242)

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(Continued from page 221)

the right to pro rata distribution. *Raywood Rice Canal & Milling Co. v. Erp.* Supreme Court of Texas. 146 Southwestern 155.

LIABILITY OF IRRIGATION COMPANY.

In an action against an irrigation company for damages for failure to furnish sufficient water to raise a full crop on a stipulated number of acres, whether a later contract, by which the company agreed to furnish a limited amount of water, was executed by plaintiff under duress, was immaterial, where the failure to furnish the water was occasioned by drought or accident, both contracts being subject to the provisions of Irrigation Act 1895 (Acts 24th Leg. c. 21), § 11, as amended by Acts 24th Leg. c. 23, requiring distribution pro rata. *Raywood Rice Canal & Milling Co. v. Erp.* Supreme Court of Texas. 146 Southwestern 155.

RIPARIAN RIGHTS.

The license given by Idaho Rev. Stat. § 3184, to the owners of land adjacent to any stream, "to place in the channel of, or upon the banks or margin of the same, dams or other machines for the purpose of raising the waters thereof to a level above the banks requisite for the flow thereof to and upon such adjacent lands," does not confer any power to appropriate, without reference to beneficial use, the entire volume of a river or its current, to the destruction of the rights of others to make appropriations of the unused water. *Schodde v. Twin Falls Land & Water Co.* Supreme Court of the United States. 32 Sup. Ct. Rep. 470.

PERCOLATING WATERS.

Where an owner of land collected into a pond thereon water from springs, seepage, percolation, and an artesian well sunk on his land, and by ditches conveyed the water to different parts of his land for irrigation, and constructed an artificial water course through which water was conveyed into a ditch running along the side of an easement and right of way of another, who during the irrigation season of each year for the last nine years used the water in irrigating his land, the latter did not acquire any prescriptive or vested right in the water as against the owner without reference to the question as to whether the common-law rule that water percolating through the soil without any definite channel is a part of the freehold should be modified, and the owner had the absolute right to intercept the water before it left his premises. *Garns v. Rollins.* Supreme Court of Utah. 125 Pacific 867.

ABANDONMENT.

The question of abandonment of a water right is one of fact to be determined by the judge or jury, as the case may be. *Central Trust Co. v. Culver.* Court of Appeals of Colorado. 129 Pacific 253.

POWER OF LEGISLATURE.

The General Assembly has power to make an appropriation to protect the rights of the state in its natural streams and the waters thereof, and the interest of its citizens acquired thereunder. *Stockman v. Leddy, State Auditor.* Supreme Court of Colorado. 129 Pacific 220.

Reclamation Notes

ARIZONA.

Plans for the reclamation of 250,000 acres of rich farming land lying between Winslow and Holbrook, and owned by the St. Louis and San Francisco Railroad Company, are well under way. A few months may see actual work commenced on the construction of irrigation dams which are to impound water to irrigate the vast area. This information was recently given out by A. S. Grieg, vice-president of the company, who recently visited Phoenix. Mr. Grieg stated that several dams would be built, as there are numerous small reservoir sites. He declined to say just how much money will be required to build the necessary dams and canals. The cost, however, will run into several millions of dollars. Several years will be occupied in completing the work.

CALIFORNIA.

Articles of incorporation have been filed by the Orange Vista Irrigation Company; principal place of business Los Angeles; capital stock \$10,000.

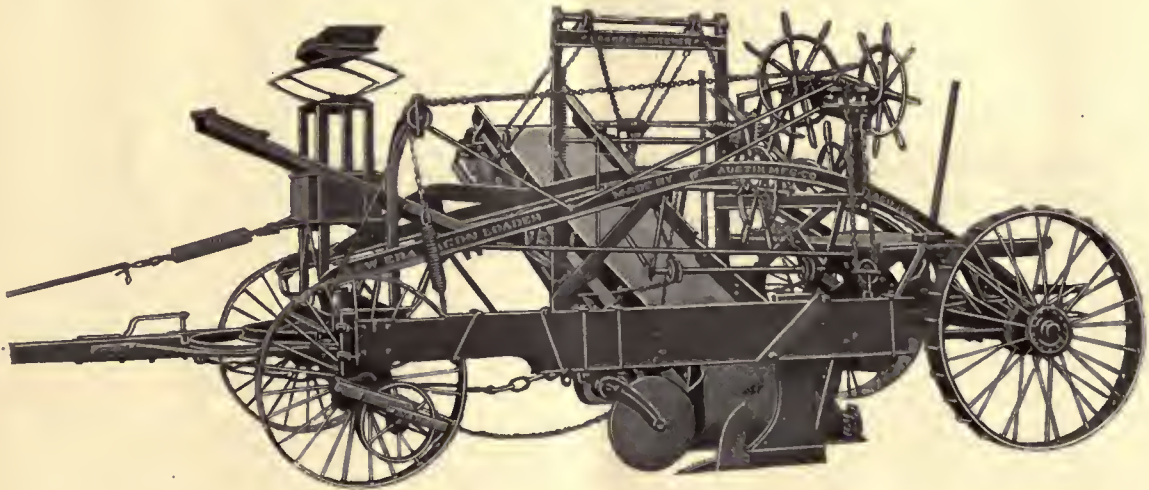
On April 6th five thousand people saw the first waters rush into the two great irrigation ditches that extended from the Goodwin Dam to the Oakdale and South San Joaquin districts, comprising 140,000 acres of land. The enterprise has meant an expenditure of \$6,000,000, all of which was raised by the owners of property within the two districts. The Goodwin dam that impounds the water of the Stanislaus river so that a portion of it may be diverted to the ditches, is located about 40 miles from Stockton.

The trouble between water users and the Fresno Canal & Irrigation Company recently reached the State Railroad Commission in the form of an action brought by D. E. Brown, a Kingsbury rancher, and others, against the Consolidated Canal Company, which is a part of the Fresno Canal & Irrigation Company's system. In view of the fact that the trouble has been brought up before the railroad commission, it is possible that other water users on other systems will co-operate with the Kingsbury people in this case. According to the complaint of Brown, the water company's service is inadequate, its practices are discriminatory and it has failed to live up to its contracts. This action followed a meeting of the Kingsbury Water users and the complaint was accompanied by a petition signed by 102 water users of Fresno, Kings and Tulare counties.

The Lucerne Valley Development Company has been organized to develop a rich valley on the desert side of the San Bernardino mountains, about twelve miles from Victorville. The articles of incorporation have been filed with the county clerk. The company will sink artesian wells and install irrigation systems and engage in general business in the valley. The directors of the company are Samuel T. Montgomery of Alhambra; F. H. Lee, of Lucerne Valley, and Fred H. Fewell, of Lucerne Valley.

(Continued on page 224)

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(Continued from page 222)

COLORADO.

The Stewart Investment Company has purchased from the Twin Lakes Land and Water Company rights to cover 1,280 acres of land south of Yuma and just west of Ordway, for a consideration of \$38,000. The land to be watered is being cut up into small tracts.

H. O. Moulton, of Pueblo, has purchased 240 acres of land known as the Grove ranch, lying directly east of Rye. The purchase includes ample water rights for irrigation.

The reclamation of 25,000 acres of land in Jackson County, by the expenditure of \$200,000 in watering the tract, has been undertaken by a group of Colorado men. The Jackson County Land and Irrigation Company, incorporated some months ago and financed by Denver capitalists, is behind the project. The land lies east of Walden. Water will be taken from Michigan creek, a tributary of the North Platte river. Two main ditches about 30 miles in length will be constructed. The incorporators of the company are James P. Miller, a banker of Lafayette, Colorado, president; Judge John Barnd, of Lafayette, secretary, and Wm. C. Mosman, of Walden.

The Federal government has placed an order in connection with the waters of the Gunnison tunnel, which may work a hardship on a number of land owners. The order is that no Gunnison waters shall be supplied to land whose owners have not subscribed all of their land to the project. In other words, no one will get water for part of his land. He must put it all under the project.

The Henry L. Doherty Company, owners of the Redlands Irrigation & Power Company, of Grand Junction, are planting 600 acres of wheat to demonstrate that wheat raising and diversified farming can be successfully carried on in that section. The Doherty people (large New York bankers), have spent thousands of dollars improving the Redlands irrigation system. They intend to construct a system of highways on the Redlands and to furnish the ranchers with electric lights from the surplus generated at the power plant.

Charles W. Martin, president of the Pueblo Water Supply & Power Company, has through the attorney for the corporation, filed with the county clerk an amended map of the company's pipe line and reservoirs. This is what is known as the Fountain Underflow Company. The first filing of the company states the desire and object to be to bring water to Pueblo for domestic use. In the amendment recently filed it is stated that the object of the company is to pipe water to Pueblo and adjacent territory for domestic and irrigation purposes:

IDAHO.

The Arrowrock dam, now being built, will be 351 feet high—the highest in the world. It will cover one acre of foundation and will contain 500,000 cubic yards of material. Its purpose is to store water to supplement the present supply available for irrigation of about 250,000 acres of valuable land in the vicinity of Boise, Idaho.

After ten years of persistency that has finally overcome numerous defeats and distressing discouragements, the settlers of the Gem Irrigation District, embracing 30,000 acres on the banks of the Snake river, 14 miles south of Caldwell, have outlived the adversities and on May 4, the water was turned into the great canals; and the big pumps operated by electricity power, will raise the water to a height of 30 feet and onto the lands of the district. Eleven years ago the first homesteader settled on the tract of land then known as Crescent Valley, and the following year W. H. Schenck, a local engineer, laid out a plan for the irrigation of the valley by pumping water from the Snake river, but his plan was thwarted by the government having taken the land under the Payett-Boise irrigation project. Later the government found the tract impracticable for the project and it was released. Bonds were finally voted and were a drug on the market until in 1911, Messrs. Smith, Carey and Chase, of Toronto, Canada, took over the bonds and contracted with the directors of the district to build the canals and install the pumping plant.

Permission has been granted the Twin Falls-Shoshone Canal Company by the state land board to sell water rights to the settlers on their project in the Shoshone basin. The company was organized and constructed its canal system and had the water ready for delivery before it was realized that the right to sell water to settlers had to be obtained. Upon the report of state engineer King the state board decided that the grant to sell the water should be given. The company was organized and financed by W. H. Long, F. L. Diffendaffer and J. E. Landis, and approximately \$70,000 was spent in opening the project. The tract to be irrigated embraces 3,500 acres and lies 30 miles southeast of Twin Falls.

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MONTANA.

Two thousand additional acres of what has hitherto been classed as dry land will be brought under irrigation by enlargement of the Cove ditch. Work will begin at the close of the irrigating season in September and water will be supplied early next year. The Cove ditch is the highest in the valley and already carries a high volume of water, all of which is now used. The additional acreage will be watered by means of pumps, as it is located too high for the gravity system.

Fire did considerable damage to the big ditch of the Bitter Root Valley Irrigation Company recently; more than 300 feet of flume and a 25-foot trestle upon which it rested were completely destroyed. The flume is located southeast of the city of Skalkahö. A large force of men were put to work immediately restoring the flume, and irrigating work was only delayed for a few days.

Actual work has been commenced on the Black Irrigation Project, which embraces a large body of land lying near Whitefish. This ditch has been talked of for several years and with its realization the people look for an increase in business and continued prosperity.

NEW MEXICO.

Word comes to us that the Camfield irrigation project on the Las Vegas land grant is to be completed. Lloyd Sigler, vice-president and general manager of the National Trust & Savings Company of Salt Lake City, Utah, has signed a contract for the construction of the partially built system. His company expects to begin in the immediate future

the completion of the dam, which has been lying in a half-finished condition for the past 18 months. It is the intention to have the reservoir filled and begin the irrigation of the tract of land lying near it early in the summer of 1914. The Trust company, in payment for the construction of the irrigation system, is to receive 8,000 acres of grant land irrigable from the big dam. This, together with the 4,500 acres belonging to private interests, will make an irrigable tract of 12,500 acres. The Salt Lake City corporation has announced through Mr. Sigler that it will make reasonable terms with persons desiring to purchase water. The price will be \$50.00 per acre for perpetual water rights. Payments will be allowed to cover ten years. It is estimated that it will cost \$500,000 to complete the project.

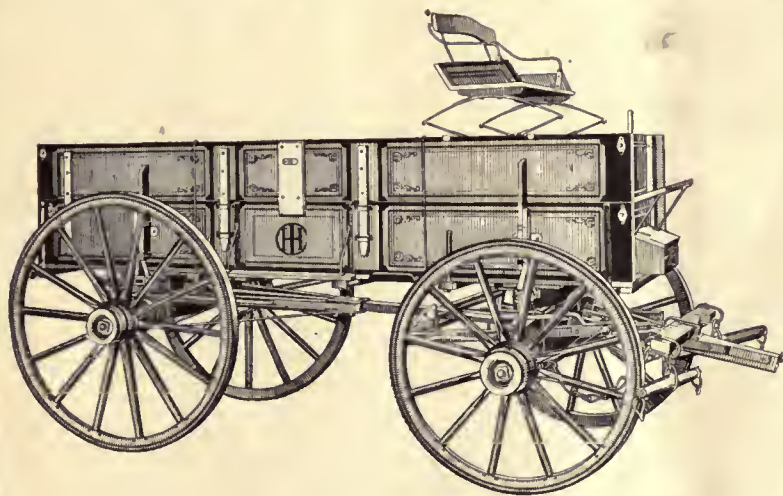
C. E. Hicks is installing a large irrigation well on his desert claim six miles south of Deming.

The Phelps-Dodge Company, of Dawson, has planned the reclamation of an immense area of land in the vicinity of Dawson by means of a reservoir and a system of canals and ditches. Thomas Murphy, of Raton, has been awarded the contract for the work, amounting to \$350,000.

UTAH.

Articles of incorporation have been filed by the Sandy Irrigation Company; capital stock, \$20,000; principal office of the company at Sandy.

The Utah-Idaho Sugar Company is preparing to reclaim 10,000 acres of land in the Bear River Valley near Brigham. It is said that the company has ample water to cover this acreage, besides the vast territory now irrigated from the Bear River canals.



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WAGON material must stand two destructive strains—one caused by the constant vibration due to travel over rough roads, the other caused by the weight of the load. These two strains affect every piece of material which enters the construction of farm wagons. That being the case the quality of the material used both in wood and steel wagons is a very important factor.

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are made of choice material throughout. Read a few interesting facts about I H C wagon material. All wood used for the more important parts of I H C wagons is carefully selected and then air-dried under cover in buildings with concrete foundations, which raise the wood above the moisture line. The lumber is held in these buildings at least two years; most of it three years; some of it, particularly that for hubs, which receives special attention, even longer. Air-drying of selected lumber produces just the qualities necessary to make it resist constant vibration and load strain. All the wood used in I H C wagons is air-dried. Weber and Columbus wagons are made entirely of air-dried wood.

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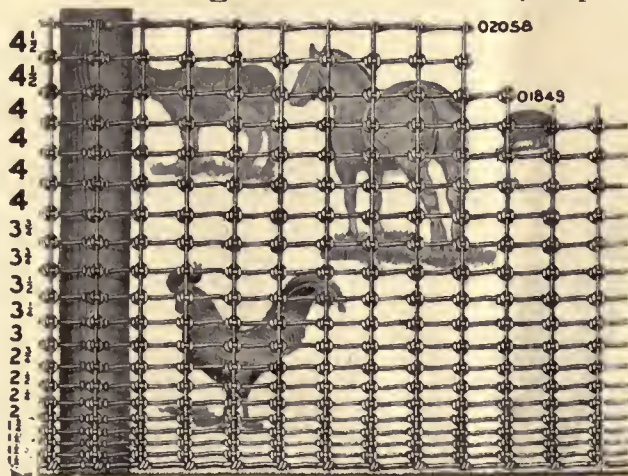
In his work on his experimental farm in Wyoming, Prof. Buffum has proved that he is the man of all men to carry Mr. Gauss' plan to completion. The friends of Mr. Gauss will be more than pleased to know that Prof. Buffum, after examining

the seed given him for further development finds that the Denver scientist had developed at least two species of wheat and rye which promise wonders. "Mr. Gauss evidently was further along toward success," says Prof. Buffum, "than he could have imagined."

One of the last and most notable editorial articles written by Mr. Gauss was a description of Prof. Buffum's work in developing new grain species, which the Wyoming scientist says was the most thoroughly scientific appreciation of his experiments ever written. Only a thorough scientist could have written the article. The only two men had much in common, in their scientific aims, and this makes it certain that Mr. Gauss' experiments, which promise so much for the semi-arid plains, will not be lost, but will be carried to their ultimate conclusion under the most favorable circumstances—*Denver Republican*.

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There is a style in the Peerless line for every purpose. Those shown above are made especially for the man who must have an extremely close mesh, combined with a weight of wire that will turn large animals.

Note the 1 1/2" spacing at the bottom; the No. 9 wire top and bottom; the No. 12 filling; spacing between cross bars either 6 or 12 inches; furnished in two styles—20 bar 58" high or 18 bar 48" high.

Made of Open Hearth Steel Wire, covered with Peerless special process galvanizing; one piece crossbar, stiff-stay construction, and the Peerless Non-slip Knot.

Send for our complete catalog showing a full line of Fencing and Gates

PEERLESS WIRE FENCE CO.

ADRIAN, MICH.

MONTHLY DIGEST.

Important law points recently decided by the Secretary of the Interior.

HOMESTEADS.

One of the objects of the homestead laws is to grant a home to every head of a family from public lands. In determining this question, the land department is not expressly charged with the duty to make judicial inquiry into facts antecedent to breach of family bond whether one party or the other was at fault. That jurisdiction properly belongs to the courts having authority to regulate family relations. Thus, if an entryman die and two claim succession as widow, the land department will not try the facts going to fix the right but will recognize her who had the status of wife during the entry and helped the entryman to earn the land.

The right to file a declaratory statement is a privilege only in the matter of giving the applicant power to hold his claim for six months after selection. Upon making entry of the land, the law as to residence must be complied with the same as if no declaratory statement had been filed.

The act of June 11, 1894, completely disqualifies the register and receiver to sit in certain cases, in which he may have been interested as counsel or related within a certain degree to any of the parties. This disqualification cannot be waived by mere failure to challenge, for the reason that public policy forbids.

ARE YOU PLANNING FOR THE FUTURE *of* YOUR DAUGHTER

WRITE FOR
INFORMATION
ABOUT

Saint Mary-of-the-Woods

COLLEGE
AND
ACADEMY

DEGREES CONFERRED: B. A., B. S., PH. B.

An Institution for

THE HIGHER EDUCATION OF YOUNG WOMEN

THE SITE OF THIS INSTITUTION is an ideal one, affording the climatic advantages of an altitude some hundred feet higher than that of the surrounding country, and combining natural beauties and salutary quiet with all the charms of suburban life.

BOATING, HORSEBACK RIDING, SWIMMING, ARCHERY, GOLF and all outdoor athletics for girls under the constant supervision of a graduate of the Sargent School for Physical Education. School course comprises INTERMEDIATE, ACADEMIC and COLLEGIATE departments. Special courses in MUSIC, ART, LANGUAGES, DOMESTIC SCIENCE and DRAMATIC ART.

THE BUILDINGS are furnished with all modern improvements in heat, light, and ventilation, and are abundantly equipped with the most approved sanitary appointments.

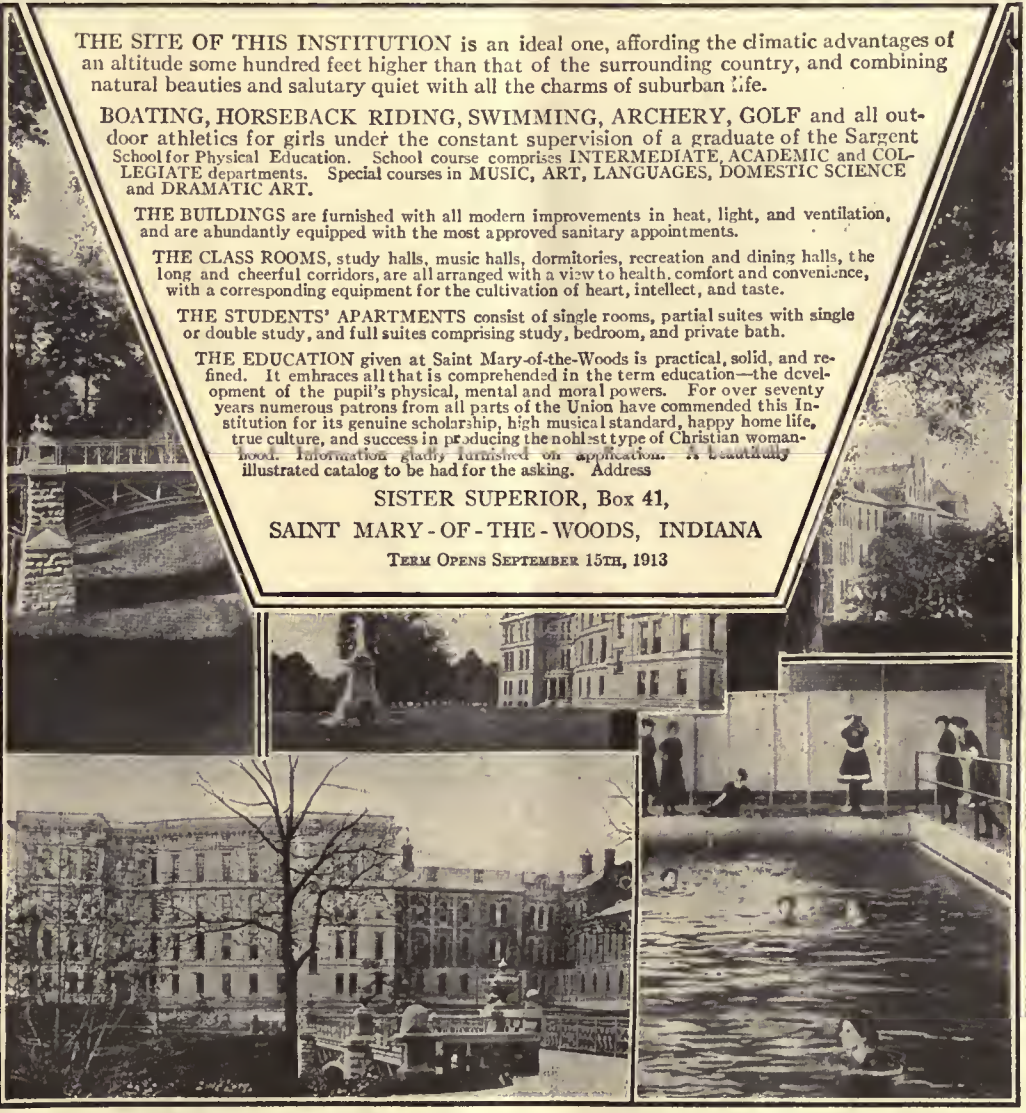
THE CLASS ROOMS, study halls, music halls, dormitories, recreation and dining halls, the long and cheerful corridors, are all arranged with a view to health, comfort and convenience, with a corresponding equipment for the cultivation of heart, intellect, and taste.

THE STUDENTS' APARTMENTS consist of single rooms, partial suites with single or double study, and full suites comprising study, bedroom, and private bath.

THE EDUCATION given at Saint Mary-of-the-Woods is practical, solid, and refined. It embraces all that is comprehended in the term education—the development of the pupil's physical, mental and moral powers. For over seventy years numerous patrons from all parts of the Union have commended this Institution for its genuine scholarship, high musical standard, happy home life, true culture, and success in producing the noblest type of Christian womanhood. Information gladly furnished on application. A beautifully illustrated catalog to be had for the asking. Address

SISTER SUPERIOR, Box 41,
SAINT MARY - OF - THE - WOODS, INDIANA

TERM OPENS SEPTEMBER 15TH, 1913



CURRENT COMMENT ON GOVERNMENT PROJECTS.

The organization of the Farmers' Mutual Telephone Association on the Minidoka project is being perfected and is meeting with good support on the part of the settlers.

The Williston, North Dakota, Chamber of Commerce is urging the citizens of that city to co-operate in a general campaign of publicity to acquaint the public with the advantages of that section. Particular attention is to be given to exploiting the agricultural resources of the government project.

The sale of town lots at Acequia, soon to be held, will establish another town on the Minidoka project.

Mayer's HONORBILT SHOES

Made of specially selected upper leather and well seasoned soles. Durable, tough, pliable. Treated by special process to keep out water and moisture. For dress-up occasion wear Mayer Honorbilt fine shoes.

Sold by leading dealers. If your dealer will not supply you, write us.

F. MAYER BOOT & SHOE CO., Milwaukee, Wis.



GALVANIZED METAL IRRIGATION FLUME

(Newcomb Patent)

Made entirely of rust-proof, galvanized iron. No bolts or rivets used in construction. This flume is considered by experts to be the most serviceable equipment for the purpose on the market. A careful examination of the construction as shown herewith will convince those who are acquainted with irrigation conditions of its lasting quality and the ease with which it may be put together. Complete information, with prices, will be furnished on application to the



Section of Flume

KLAUER MFG. COMPANY, Dubuque, Iowa

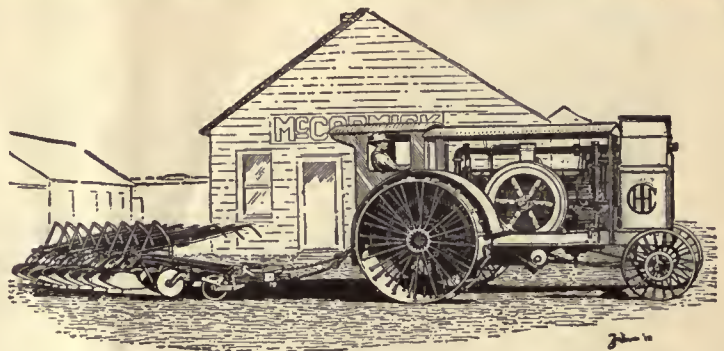
Make Your Work Count

WHEN you start your spring work this season — plowing, harrowing, rolling, seeding, etc., — you can make your work easier, do it faster and better, and save money besides by putting an I H C tractor on the job. If your farm is small, buy a small tractor, 12, 15, 20, or perhaps 25-horse power; if large you can use a 25, 30, 45, or 60-horse power machine to advantage. An I H C tractor makes your work count. With it you can plow from two to ten times as much ground in the same time as with a horse plow. You can plow, harrow and roll at the same operation; you can draw two to four drills; at harvest time you can use it to draw the binders. It saves time and money in every operation. Make your work count.

Buy An I H C Oil Tractor

Besides doing the other work at a saving, you can use it also for threshing, grinding, road making, irrigating, or any other belt power and draw bar work to which it is adapted. When used for all the work that it will do, the I H C tractor is one of the handiest machines, also one of the most economical, that you can have on your farm.

I H C tractors are made in all styles, and in 12, 15, 20, 25, 30, 45, and 60-horse power sizes. They operate on low or high grade fuel oils.



I H C general purpose oil and gas engines, which can be used to run any farm machine to which power can be applied, are made in 1 to 50-horse power sizes. These engines furnish the steady power required for use in shop, mill and factory. They operate on gas, gasoline, naphtha, kerosene, distillate, or alcohol.

The I H C local dealer will give you catalogues of I H C tractors and engines, and will give you full information about the whole line, or you can secure it by writing the nearest branch house.

WESTERN BRANCH HOUSES

Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

International Harvester Company of America
(Incorporated)

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When writing to advertisers please mention The Irrigation Age.

20 Reasons Why You Should Investigate the **SANDOW Kerosene Stationary ENGINE**



It runs on kerosene (coal oil), gasoline, alcohol or distillate without change of equipment—starts without cranking—runs in either direction—throttle governed—hopper cooled—speed controlled while running—no cams—no valves—no gears—no sprockets—only three moving parts—portable—light weight—great power—starts easily at 40 degrees below zero—complete, ready to run—children operate them—5-year iron-clad guarantee—15-day money-back trial. Sizes 2 to 20 H. P. Send a postal today for free catalog, which shows how Sandow will be useful to you. Our special advertising proposition saves you one-half cost of first engine sold in your county. (167) **Detroit Motor Car Supply Co.** 178 Canton Ave., Detroit, Mich.



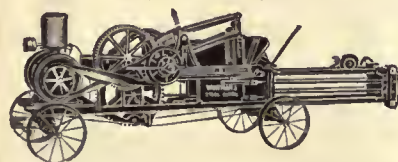
Whitman's Sultan Engine
Means \$\$\$\$

to the man that operates a Hay Press. Less ex-

pense in upkeep. Cheaper Repair Bills; Less Breakage. When you buy a **WHITMAN Steel Queen Hay Press** or **Alfalfa Baler** you get an engine on your press that is built by the same factory that builds the press. Every experienced hay baler knows the quality of **Whitman's World's Standard Baling Presses** and knows when he buys a **WHITMAN Press** he has that guarantee for life that has made **WHITMAN** machines so famous in every country in the world.

Write for Hay Press Catalogue and Gasoline Engine Catalogue and secure best at start.

Whitman Agricultural Co.
St. Louis, Missouri, U. S. A.



Send \$1.00 for
The Irrigation Age
one year and
The Primer of Irrigation

ENGINES and PUMPS for IRRIGATING

We furnish all equipment necessary for up-to-date pumping plants. Engines from 2 to 50 horse power. Pumps, all types and sizes.

Centrifugal Pumps, Shafting, Belting, Iron Pipe, Valves, Fittings, Etc.

We can save you considerable money. Let us figure on your requirements. Write for our Special Engine and Pump Catalog giving money saving prices.

UNITED STATES ENGINE WORKS, 515 Fifteenth Place, Chicago, U.S.A.



The Brevoort

IRRIGATION DOES IT INTEREST YOU? If so, send for our **SPECIAL FREE CIRCULAR**, showing **SAND PROOF STEAM. IRRIGATING AND DRAINAGE PUMP.** No Engine required with this pump

Sand on either outside or in cannot injure them. Will raise and force water, sand and gravel any distance required.

Saves fifty per cent of fuel.

Most economical irrigating and drainage pump to both install and operate now on the market. Will work submerged if required.

Has given 16 years of satisfaction to the largest concerns in America.

STANDARD MACHINERY CO., Fisher Bldg., Chicago, Ill.



An Independent Irrigating System Is the Best

INDEPENDENT irrigating systems, when properly operated, prove true to their title—they make you independent of rain or other uncertain sources of supply.

Almost without exception, they prove the cheapest and most satisfactory. If you are able to secure a sufficient supply of water by sinking wells, or from a lake or stream, you should start today to lay out a good irrigating system. Dependable power is easy to obtain. An

I H C Oil and Gas Engine

will take care of the pumping and will also furnish power to run any farm machine. It will require no watching except to keep it properly oiled. It is the cheapest and most dependable power you can secure.

I H C engines are built in many styles—vertical, horizontal, portable, skidded, air-cooled, water-cooled; in sizes from 1 to 50-horse power. They operate on gas, gasoline, naphtha, kerosene, distillate, alcohol. I H C tractors are built in sizes from 12 to 60-horse power. There are also spraying, pumping, hay baling, wood-sawing, outfits, etc.

Get our interesting irrigation catalogue from the I H C local dealer, or, write the nearest branch house for a copy.

WESTERN BRANCH HOUSES: Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

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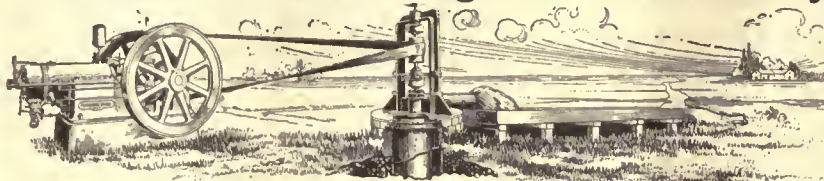
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Fairbanks-Morse Irrigation Machinery



OIL ENGINES AND

Engines and pumps designed and made in our own factory. High efficiency guaranteed. Pumps are of especially strong construction and will handle large quantities of water economically and efficiently.

CENTRIFUGAL PUMPS

Our oil engines develop as much power on a gallon of kerosene or distillate as on a gallon of gasoline. Very economical in the use of fuel.

Ask for Catalog No. 650-A11

Fairbanks, Morse & Co. 900 S. Wabash Avenue
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Wagon and Portable Scales, Electric Light Plants, Windmills, Feed Grinders

Use KEROSENE Engine Free!

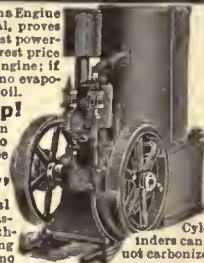
Amazing "DETROIT" Kerosene Engine shipped on 15 days' FREE Trial, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing. No waste, no evaporation, no explosion from coal oil.

Gasoline Going Up!

Gasoline is 9c to 15c higher than coal oil. Still going up. Two pints of coal oil do work of three pints gasoline.

Amazing "DETROIT"

—only engine running on coal oil successfully, uses alcohol, gasoline and benzine, too. Starts without cranking. Only three moving parts—no cams—no sprockets—no gears—no valves—the utmost in simplicity, power and strength. Mounted on skids. All sizes, 2 to 20 h. p., in stock ready to ship. Engine tested before crating. Comes all ready to run. Pumps, saws, threshes, churns, separates milk, grinds feed, shells corn, runs home electric lighting plant. Prices (stripped), \$29.50 up. Sent any place on 15 days' Free Trial. Don't buy an engine till you investigate the money-saving, power-saving "DETROIT." Thousands in use. Costs only postal to find out. If you are first in your neighborhood to write, you get Special Extra-Low Introductory price. Write! (138)
Detroit Engine Works, 301 Bellevue Ave., Detroit, Mich.



Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics, add \$2.50 to above price.

Farmers' Fortunes Easiest to Make in the AMERICAN Northwest

Make YOUR money farming in your OWN country—no place on earth offers you greater agricultural opportunities, finer climate, better lands or a greater variety of big yielding, money making crops than our own AMERICAN Northwest. You are positively missing wealth-creating chances to better yourself, to make more money, to live a healthful, profitable farming life in America's most ideal farming, stock, gardening and fruit regions if you do not write for our HANDSOMELY ILLUSTRATED BOOKLETS about the rich lands and openings for YOU along the NORTHERN PACIFIC RAILWAY lines.

Here are about 30,000,000 acres of Government Homestead Lands—valuable lands available to you for proving up under the new and easy Homestead Law which requires only three years to get your title and allows five months leave of absence each year. Think of this chance to start with little and make good in a big way! Here are magnificent improved farms, homes and buildings ready for you, which you can get for little money. And crops here are yielding enormous wealth to land owners while land values are advancing rapidly. Get YOUR farm home in "THE PROSPERITY STATES OF AMERICA" along the



NORTHERN PACIFIC RY

Locate in this land of prize crops and cattle. The world's greatest prize for wheat, a \$5,000 tractor outfit, was won by farmers in Montana on our line. The farm of Ed. Conley, near McKenzie, N. D., produced crops last year which sold for more than he paid for the land. One man on 40 acres made a fine living for his family of eleven and put \$2,385 in the bank! Such instances are numerous. Investigate! Let us help you locate on land famous for wheat, oats, barley, flax, rye, fodder corn, alfalfa (3 crops a year), timothy. Or start a garden farm. Raise with great success and profits—potatoes, onions, peas, beans, all vegetables. Great ranches for horses, sheep hogs, etc. Dairying, poultry, bees—all thrive. Greatest apple orchards on earth—all fruits profitable. Whatever you want, the Northwest has it. We will gladly help you with information, free literature and LOW RATE EXCURSION TICKETS to look the country over. Mark and mail this Coupon today, or write to

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FREE TO HOMESEEKERS

Mark below the State which most interests you or check the line of farming you wish to follow. Finely illustrated booklets will be sent you without charge.

☐ Minnesota ☐ North Dakota ☐ Montana ☐ Washington ☐ Idaho ☐ Oregon
I favor ☐ grain raising, ☐ mixed farming, ☐ stock raising, ☐ gardening, ☐ dairying, ☐ fruit growing. (Mark which).

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Please send me without obligation, booklets as marked above

NAME _____ ADDRESS _____

TOWN _____ STATE _____

309



Gates and Valves

Are you sending irrigation water through dirt ditches? If so, half of it is seeping down through the sand, and your money is going with it.

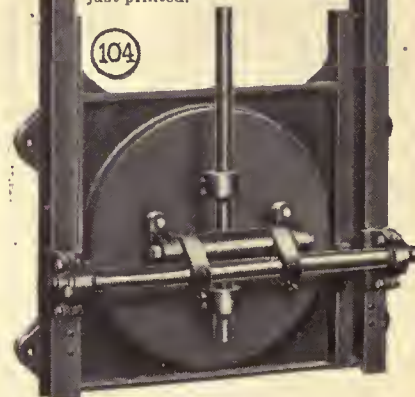
We are the originators of the scientific irrigation system. Our Gates and Valves are the product of many years' investigation, study and improvement—the best in the world.

Install our economical irrigation system as others are doing—and do it before you lose in the race for dollars through wasteful methods and keen competition. The



1226 EAST 28th STREET,
LOS ANGELES, CAL.

Will plan your irrigation system free of charge. Clip this ad, mail to us and we will forward our booklet on up-to-date Irrigation Systems, 7th Edition just printed.



When writing to advertisers please mention The Irrigation Age.

Watch These Things

By R. E. Olds, Designer

The leading cars this year have these features in them. They are things you should insist on.

Left Drive

Practically all the great cars of 1913 have the left-side drive. That means, of course, that others must adopt it.

They don't have projecting side lamps. They use electric set-in dash lights, as used on Reo the Fifth.

They are not under-tired. Skimpy tires, which double one's tire bills, are now much out-of-date.

Better Parts

Then today's idea among leading makers is to build enduring cars. To cut down cost of upkeep.

The best cars now, for years and years, will run as well as

new. But that isn't so with cars hurried and skimped—cars merely made to sell.

Note what it means to build a really honest car.

Reo the Fifth is built of steel made to formula—steel that we analyze twice.

Its gears are tested in a crushing machine of 50 tons' capacity. Its springs are tested for 100,000 vibrations.

Each driving part, as a margin of safety, is 50 per cent overcapacity.

We use 15 roller bearings, costing five times as much as common ball bearings. We use 190 drop forgings, to avoid the risk of flaws.

A \$75 magneto—a doubly-heated carburetor—tires 34x4.

Parts are ground over and over to get utter exactness. Engines are tested for 48 hours. Cars are built slowly and carefully. There are

countless tests and inspections.

Every Reo the Fifth marks the best I know after 26 years of car building.

New Control

And it has the new control. All the gear shifting is done by a single rod between the two front seats. It is done by moving this rod only three inches in each of four directions.

There are no levers, side or center. Both brakes are operated by foot pedals. So both front doors are clear.

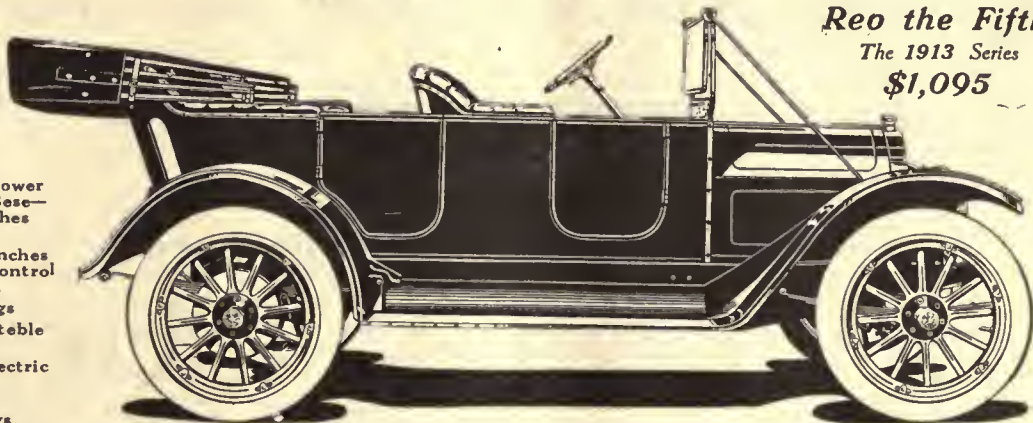
Men are coming to cars built like this. Last year's demand was twice our factory's output. Every man who buys a car for keeps ought to know this car.

Write for our catalog and we will direct you to the nearest Reo showroom. They are everywhere.

R. M. OWEN & CO. General Sales Agents for **REO MOTOR CAR CO., Lansing, Mich.**
Canadian Factory, St. Catharines, Ont.

Reo the Fifth
The 1913 Series
\$1,095

30-35
Horsepower
Wheel Base—
112 Inches
Tires—
34x4 Inches
Center Control
15 Roller
Bearings
Demountable
Rims
Three electric
lights
190 Drop
Forgings
Made with
5 and 2
Passenger
Bodies

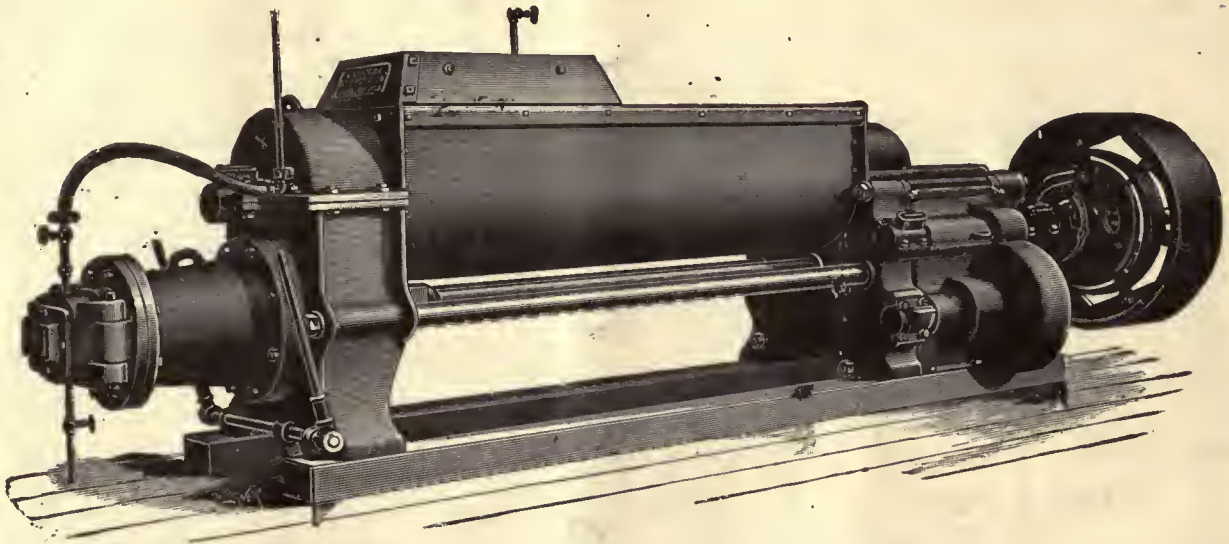


Top end windshield not included in price. We equip this car with moheir top, side curtains and slip cover. windshield, Prest-O-Lite gas tank for headlights, speedometer, self-starter, extra rim and brackets—all for \$100 extra (list price \$170). (Grey & Davis Electric Lighting and Starting System at an extra price, if wanted.)

(194)

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UNION MACHINES WITH PUG MILLS COMBINED



FIVE SIZES ALL CAPACITIES

Outfits for Drain Tile, Hollow Ware, Building
and Paving Brick and other Clay Products

If interested write us for particulars and estimates.

E. M. FREESE & CO.
GALION, OHIO

When writing to advertisers please mention The Irrigation Age.

Hollow Core Wall for Hydraulic Fill Dams

In a Hydraulic Fill dam the problem of the drainage of the sluicing water is of controlling importance. The sluiced material should be such that it will not retain the sluicing water for an undue time. If the material is such that it will not deliver the water with reasonable rapidity a decided settlement with consequent cracks is bound to ensue when the fill ultimately dries out.

The sluicing water on the fill is maintained in a summit pool by hand-made levees. It is found that in depths downwards to 5', the material in suspension becomes comparatively solidified and it will then hold its shape and consistency. The sluicing water, however, must necessarily be under constant drainage if rapid construction and solid banks are expected.

A Hydraulic Fill dam during construction generally has water in the impounding reservoir above it which rises at substantially the same rate as the increasing height of the dam, but a little below its level, thereby reducing the drainage head in that direction. Assuming that there is no core wall, the sluicing water is forced to pass largely through the down stream fill unless drainage tubes in some form are provided. The passage of the drainage water through such a mass of material is slow, and hence full advantage cannot be taken of the otherwise rapid method of hydraulic construction.

Again, the material of the fill will not take its final set until the fill is complete. The fill is therefore saturated during construction, and saturated material is always of greater bulk than dry material. This fact accounts in a measure for the excessive settlement in hydraulic fills.

All this is controlled by building a Hollow Core Wall through the center of the embankment, and providing it with numerous drainage gates of simple construction. A facing of broken stone or gravel should be placed next to the upstream face of the core wall.

It is evident at a glance that with this construction we have accomplished two things:

First, we have provided an effectual water-barrier whereby when the lower prism of the dam is once drained it is forever protected against re-saturation.

Second, the problem of drainage is entirely under control and can be hastened or retarded at will. Drainage head is secured in two directions, namely, towards the core and towards the toe. The material more quickly receives its final set and unexpected settlement is thereby avoided. The time of construction is greatly hastened.

Moreover, in the usual form of construction the levees on the outside edge of the pond frequently give way and permit a localized washout on the slope of the fill. The central drainage into the Hollow Core Wall permits of instant relief of excessive water and makes a washout impossible.

Again, if the sluicing material is such that it settles rapidly, the surface water can be quickly drawn off into the Core Wall.

Once the fill is completed the drainage gates into the Core Wall from the lower prism are permanently opened. This insures an absolutely dry prism; a result never before reached.

The above is a mere outline of the functions of the Hollow Core Wall in relation particularly to the Hydraulic Fill during construction. The advantages named in a previous advertisement in connection with an ordinary rolled earth dam apply in full to the Hydraulic Fill when the same is completed and in permanent service.

The above notes are fairly illustrated by the sectional drawing herewith presented which roughly represents a Hydraulic Fill Dam in process of construction. The Hollow Core Wall is carried up to and a little above the ultimate embankment and provides interior inspection through the heart of the fill.

This topic is more fully treated in our Circular on EARTH DAMS. The introduction of the Hollow Core Wall entirely changes the basic problem of an earth dam, whether of rolled earth or hydraulicked into place. These points will not admit of discussion in an advertisement.

Respectfully submitted,

AMBURSEN HYDRAULIC CONSTRUCTION CO.
ENGINEER-CONSTRUCTORS, 88 Pearl St., Boston, Mass.

All inquiries from Canada should be addressed to
Ambursen Hydraulic Construction Co.,
405 Dorchester St., West, Montreal, P. Q.



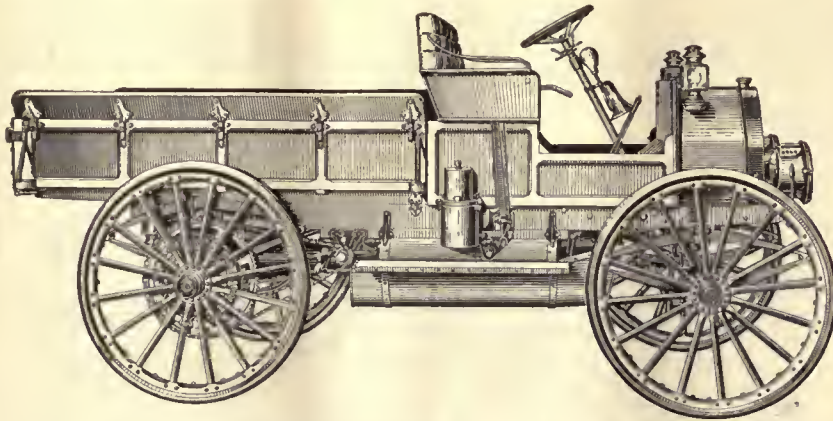
HYDRAULIC FILL DAM WITH HOLLOW CORE WALL IN PROCESS OF CONSTRUCTION

SPECIAL NOTICE

We take pleasure in announcing that we have perfected an arrangement whereby Messrs. Lewis & Wiley of Seattle, Washington, become associated with us in all work involving the sluicing of earth for the construction of dams or for any other purpose. The reputation of the above concern was made in the famous re-grade of Seattle, whereby the hills of that city were cut down and used for fill on the water front. A similar contract has been carried out by this company in Portland, Oregon, and a third one is now in progress in Seattle.

Messrs. Lewis & Wiley are undoubtedly the foremost concern in the world in this special line of work, and we deem ourselves fortunate in securing their association with us.

AMBURSEN HYDRAULIC CONSTRUCTION CO.



Can You Use This Truck

If your business is one that demands prompt deliveries, or requires a great deal of light hauling, you can use an International Motor Truck, perhaps more than one, and save money by its use.

With seven years of experience to teach us, we have developed this truck along the lines of greatest usefulness and closest economy for the use of business men in city and country. The improve-

ments made have all been dictated by experience and they have all been of the kind technically known as refinements. The 1913 model is an efficient business wagon, just what you need to put your delivery service on the most up-to-date and economical basis.

International Motor Trucks

are furnished with any style of body desired. Our agents are instructed to see that your driver thoroughly understands the car before he takes charge. A repair part service is maintained at each of our general agencies, located in nearly a hundred of the principal cities of the country, protecting you from delays caused by unavoidable accidents. You are safe in buying an International Motor Truck. It saves money and it makes money for the man who can use it.

If you are that man, write us and receive catalogue and full information. The longer you delay the more you lose.

International Harvester Company of America

(Incorporated)

Harvester Building

CHICAGO U S A

The Two Leading Magazines of Their Kind in the World

IRRIGATION AGE CHICAGO, ILL.

The pioneer and only publication of its class in the world. Published monthly. Special articles each month by authorities on irrigation. Invaluable to the homeseeker, engineer, expert, colonist and irrigation farmer, and all those in any way interested in irrigation.

The publisher of Irrigation Age has recently purchased the National Land and Irrigation Journal of Chicago and the Irrigator of North Yakima, Wash., and the combined circulation of both has been merged with that of the Age.

One Dollar Per Year

**Irrigation
Age**

30 N. Dearborn St.
CHICAGO

BETTER FRUIT' HOOD RIVER, ORE.

A beautifully illustrated monthly magazine, published in the interests of modern and progressive fruit growing and marketing. The editorials are strong features. Better Fruit is edited by a practical fruit grower, who has been in the business for many years. Consequently, Better Fruit contains just what the fruit grower wants to know.

One Dollar Per Year

**Better Fruit
Pub. Co.**

Hood River
OREGON

COMBINATION OFFER IRRIGATION AGE

30 North Dearborn Street, CHICAGO

Enclosed herewith find \$1.50 for which please send me THE IRRIGATION AGE and "BETTER FRUIT" for one year.

Name.....

Street No..... City or Town.....

County..... State.....

When writing to advertisers please mention The Irrigation Age.



This splendid 70 gallon vertical suction, centrifugal Buffalo Pump for only

\$28.50

Larger Sizes in Proportion

"Buffalo" Vertical Suction Centrifugal Pump—the highest pump value ever offered at the price

We are prepared to make stock shipments from factory of this highly recommended and exceedingly popular irrigation pump, used for heads not exceeding over 50 feet. It belongs to the trade-marked "Buffalo" Class M family, which has won just recognition as the highest value obtainable in popular priced centrifugal pumps. The outfit includes pump, pulley, companion flanges and coupling for both suction and discharge, as shown. Only the finest white babbitt metal is used in the extra long bearings, which are furnished with brass compression grease cups. Thrust bearing is of ball bearing type. It may be installed by attaching the suction flange directly to the well casing, the pump itself being set between two vertical timbers, which also carry the shafting, bearings, etc., and is driven by pulley located above the ground at top of the well. Bearings, shaft collars, and steel shafting can be supplied at a slight extra cost to suit your individual requirements. Being accurately made and fitted, all parts of the pump are interchangeable and can be promptly duplicated at any time. Couplings are bored same size as shaft and bearings. Larger sizes also made. The price quoted is f. o. b. our factory.

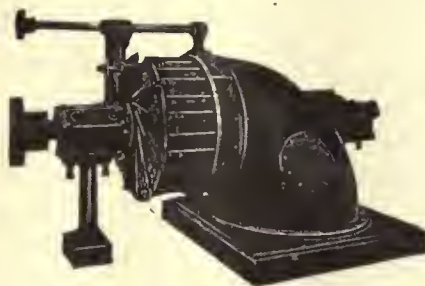
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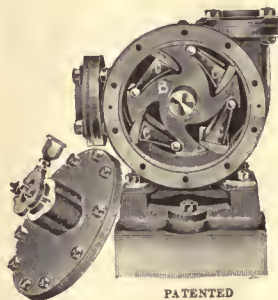
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Twenty-Eighth Year

THE IRRIGATION AGE

VOL. XXVIII

CHICAGO, JUNE, 1913.

No. 8

THE IRRIGATION AGE

With which is Merged

The National Land and Irrigation Journal

MODERN IRRIGATION

THE IRRIGATION ERA

ARID AMERICA

THE DRAINAGE JOURNAL

MID-WEST

THE FARM HERALD

THE IRRIGATOR

D. H. ANDERSON

PUBLISHER,

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Old No. 112 Dearborn St.

CHICAGO

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D. H. ANDERSON, Editor

ANNOUNCEMENT.

The "Primer of Hydraulics" is now ready; Price \$2.50. If ordered in connection with subscription \$2.00.

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Official organ of the American Irrigation Federation. Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 28 years old and is the pioneer publication of its class in the world.

Lane Promises Broader Policy.

A Denver exchange states that an interview with Secretary of Interior Lane gave Jos. A. Simpson, well known from his connection with a number of large irrigation enterprises, the impression that a much broader policy would be followed by present secretary than by his predecessor. Secretary Lane told Mr. Simpson that he was at present getting his bearings. It is believed that the rules of the department as enforced by the various secretaries since Pinchot's idea became dominant, would be entirely changed. Mr. Simpson talked with the secretary in regard to a large Carey Act project, intended to embrace ultimately 280,000 acres in eastern Utah on the Green river. The project contemplates a dam on the Green river, and the irrigation of tracts on both sides of the river below. All of the preliminary plans are completed and the undertaking, it is expected, will be pushed ahead as soon as a favorable decision from the department of the interior is received. Judging from reports of this character, which reach us from time to time, from the west, we get the impression that there is a renewed activity along the line of irrigation under the Carey Act. This is a cheerful outlook and means much for the west.

Census Bureau Irrigation Report.

The importance of the irrigation of the arid states is illustrated by records of the United States census bureau which show that the total cost of such enterprises has increased about 300 per cent in the last ten years. This takes in the period since the passage of the Reclamation Law. In no state of the arid region was the increase less than 100 per cent. The final cost as estimated nearly three years ago was about \$424,000,000. The last census shows about 160,000 farms, representing 14,000,000 acres under irrigation. Alfalfa is the big irrigated crop. The last available census report which covers the year 1909 shows that more than 2,000,000 acres of this crop were cultivated on irrigated land in that year, the value being nearly \$60,000,000, or more than three times in value that of the next most valuable product—orchard fruits. The census report shows that irrigation is being extensively practiced in the growing of rice in Louisiana, Texas and Arkansas where more than 95 per cent of the 1910 crop of this staple was harvested. From these figures, it will be readily seen that the heavy investments by the federal government under the Reclamation Law, and the expenditures of individuals on private reclamation projects are producing excellent results.

It is reasonable to suppose that more than the total sum of \$424,000,000 which has been expended—and that sum may at this time have reached a total of \$500,000,000—has been returned to the farmers in a single year through money received from crops. If alfalfa on 2,000,000 acres will produce a total sum of \$60,000,000 in one year, it is fair to presume that the other 12,000,000 irrigated acres will produce crops during the same period of sufficient value to equal the whole expenditure on federal and private projects for the entire ten years. If this is true, it should prove good material for consideration by those who decry the possible results of money making on irrigated areas. We would advise those who are objecting to irrigation expenditures, to secure the census report on irrigation and go over it carefully.

**Amend
Plant
Quarantine
Act.**

The Federal Horticultural Board has recommended some changes in the rules and regulations for carrying out the Plant Quarantine Act. The changes are as follows:

Immediately upon the entry and before removal from the port of entry, the nursery stock for each separate shipment or consignment thereof, the committee shall notify the Secretary of Agriculture, through the collector of customs where entry is made on forms provided for that purpose, stating the number of permit, the date of entry, the general nature and quantity of the nursery stock, the country or locality where grown, and the name and address of the consignee to whom it is purposed to forward the nursery stock, together with the probable date of delivery for transportation. At the same time, a copy of the notice to the Secretary of Agriculture shall be sent by the permittee to the duly authorized inspector or other officer of the state, territory, or district to which the nursery stock is to be shipped. Lists of such inspectors or officers may be obtained on application to the collector of customs, or the Federal Horticultural Board, Washington, D. C. Permits may be cancelled and further permits refused if a permittee fails to give either of said notices, or gives a false notice, or knowingly mislabels any nursery stock with intent to evade any provision of the Plant Quarantine Act or regulation thereunder. Should a consignee named in such a notice ship or deliver for shipment to any other state, territory or district such nursery stock before it has been inspected by a duly authorized state, territory or district inspector or officer, he shall prior to such shipment give notice to the Secretary of Agriculture and to the duly authorized inspector or other officer of the state, territory or district to which the nursery stock is to be re-shipped. Imported nursery stock which has been once inspected will be allowed to move interstate without restrictions

other than this imposed on the interstate movement of domestic nursery stock.

These changes appears to us to be a wise move and should be productive of good results in introducing foreign grown nursery stock to this country.

**James J.
Hill¹
Gives
Advice.**

Hasten the completion of the reclamation projects already under way, and be sure that you have competent men in the field, is the advice given by James J. Hill, president of the Great Northern Railway, to Secretary Lane at a hearing on reclamation recently held in Washington. Mr. Hill reiterated former statements to the effect that it costs the reclamation service more than twice what it costs other service and private corporations to reclaim desert areas. This statement was objected to by Director Newell of the Reclamation Service and Senator Walsh, of Montana, who questioned the knowledge of Mr. Hill on Reclamation Service work. Mr. Hill stated that he had never built a mile of irrigation canal in his life, but he knew that when private enterprises in Canada could sell land and water for \$30.00 an acre, while the same quality of land and quantity of water shows a cost to the Reclamation Service of \$45.00 an acre, there must be something wrong. Director Newell in reply stated that the government work was more permanent than that built by the average private corporation, and that serious mistakes were frequently made by private corporations who were prone to take in too large an acreage for the water capacity; he stated further that the government could work only eight hours a day, and that ten hours a day was the ruling time on private enterprises. Mr. Hill insisted that the last statement was another reason why the government should go out of the business and leave it all to private enterprises.

Mr. Hill's attitude is really surprising, in view of the fact that he was one of the early supporters of the movement which resulted in the Reclamation Law. If the writer's memory serves him right, Mr. E. P. Ripley, president of the Santa Fe Railway, was the first man to take an active part in organizing the National Irrigation Congress, and through his efforts assistance was secured from the leading men of the west and southwest, and later on George H. Maxwell came into the field as assistant lecturer to Judge Emery, who was then alive and active in the work. Maxwell subsequently took Judge Emery's place, and induced the railway companies to organize and furnish a fund for this propaganda of national reclamation. That part of Mr. Maxwell's work was commendable and will place him on the role of leaders in that movement. In this connection, it may not be out of place to state that the reclamation reports constantly refer to the Reclamation Law as the "Newlands Act," when

in point of fact, Senator Hansborough was the father of the bill and if any individual is to receive credit, ex-Senator Hansborough should be given that honor. Incidentally, Senator Newland's name is used in this connection by the Reclamation Service and the senator seems to reciprocate by rushing to their defense whenever they are in danger.

**Exceptions
Taken
To May
Editorials.**

Exceptions were taken to editorials in our May issue by various individuals connected with the Reclamation Service concerning the method of securing representatives of the Water Users' Association, who attended the reclamation hearings before Secretary Lane, in Washington, during the month of May. One correspondent finds it difficult to understand how we reached our conclusions as to the plan of meeting, and on what we base our charge that the Reclamation Service maneuvered to have invitations sent to its friends. One correspondent declares that the Reclamation Service had nothing whatever to do with the men who came from the projects, as Senator Lane did not restrict his invitations to members of these various bodies, and that every man who had a complaint to make was asked to attend or present his complaint in writing. In reply to these criticisms we have to say that the only means we have of securing quick news service from Washington is by taking what the daily papers of Chicago get from their various Washington correspondents. It would appear that the Washington correspondents have not been as careful to verify some of their reports by reference to the heads of departments. A communication from one of our subscribers at the national capital gives another angle to the criticism. He says the Washington correspondents are not given "straight goods" concerning reclamation affairs and that we should secure the official reports of all proceedings. This we wrote to secure, but was informed that the department hasn't the means to publish a transcript of proceedings of this hearing.

It is possible that the proceedings may be printed by order of Congress. Until such report is brought out, and all of the facts obtained, it may be well to suspend judgment at the present time, and await the outcome. One who attended all of the sessions, states concerning the Arizona matter which was given a hearing, that he can not truthfully say that the secretary was not at all times fair in his attitude; that he seemed quick in catching the drift of affairs, and was fair in his statement and discussion of other matters brought up. It occurs to us that the proceedings of this hearing are of sufficient importance to warrant the authorization of the publication of a full report by Congress.

**A Settler's
Experience,
Victoria,
Australia.**

We are presenting in this issue, article No. 2, by Mr. Thomas Bunbury, Ballendella, Victoria, Australia, on "A Settlers Experience In The Irrigation Area of the State of Victoria, Australia." Mr. Bunbury very kindly consented to prepare a series of three articles on this subject, the first article having appeared in our issue of April 1913. In a recent communication from Mr. Bunbury, he informs us that he will send in a short time article No. 3 in which he will be able to clearly state how he started on small capital, and is now fairly well on the road to success. Unlike the majority of correspondents who relate their experiences as beginners on irrigation tracts, Mr. Bunbury gives us all the details, holding back nothing that would prove of value to those similarly situated. These articles will give our readers a more clear idea of actual conditions in Australia than it would be possible to obtain from ordinary sources.

**Protection
Against
Land
Frauds.**

The German Evangelical church is developing a plan for the protection of its members against land frauds, and one of its pastors states that they have special need of help, because they are people of simple honesty, dependent in a large way on advice of their spiritual guides for the conduct of business matters. There is no doubt that combined action should be taken by the various churches to secure information concerning various sections of the country where unusual offers are made to intending settlers. During the top wave of irrigation enthusiasm, a few years ago, various unscrupulous agents succeeded in unloading a large quantity of unproductive land on people who could not afford to be misled, and many of these purchasers suffered hardships in consequence. The various church organizations should instruct their members to beware of land sharks and land deals offered in the west as they would of a land shark in their own territory.

During the irrigation excitement, a number of mail clerks called at the office of THE IRRIGATION AGE, and asked for information as to where they could locate advantageously. At that time, one particular section of a northwestern state was being boomed, and the writer had definite knowledge as to its possibilities. It happened that on inquiries by the group of mail clerks, shortly after the writer's return from that section of the country, he advised them to send some of their members to investigate with a view to purchase. The writer was not personally acquainted with the men interested in this project and had no interest at all other than to benefit those making the inquiry. As matters turned out the company which was booming this particular section got into trouble, and the development of the project was delayed for a year or more. Meanwhile, the men who were sent out to in-

vestigate reported favorably, and a lot of the mail clerks purchased land in that vicinity, and were consequently inclined to think that they had been misled by the advice of the writer.

The company referred to was subsequently re-organized, and since then that section of the country has shown wonderful development, and all of the men who invested are doing well. This incident is cited to show how a man may honestly advise another and yet mislead him. That circumstance taught the writer a lesson, and he has never, in reply to other inquiries, specified any particular project or section of the country. The advice given has always been to take a sufficient sum of money to make a general tour of the west, and not to purchase until several projects have been carefully examined so that the intending purchaser may judge by comparison which is the better of the lot. This is the advice that THE IRRIGATION AGE offers now to all intending settlers on irrigation areas of the west. One or two hundred dollars spent in careful investigation of not one, but several localities, is the best initial investment that any possible colonist may make.

Electric Car Service at Twin Falls, Idaho.

When it comes to making improvements that count we must give full credit to the enterprising people of southern Idaho. As the readers of this journal are aware it is only a little more than five years ago that the country south of the Snake river was a barren waste. Today it is dotted with profitable farms and prosperous towns. A branch of the Oregon Short Line has been constructed through this part of the state as far west as Buhl. Twin Falls, the principal town, is a thriving, handsome place of 8,000 or 10,000 people, thoroughly up to date in modern conveniences. This development is entirely due to the efforts of such progressive people as I. B. Perrine, H. L. Hollister, Frank S. Buhl, the Kuhns, of Pittsburgh, and the extraordinarily good class of settlers whom they have induced to locate in the Twin Falls country.

Wonderful as are the changes wrought in that region the people were hardly prepared to give serious attention to another development project suggested by Mr. Perrine something over a year ago—that of building and operating an electric railway between Twin Falls and Shoshone Falls. Even the doubters admitted that it would be a good thing, but few could see how it was to be accomplished. It was in their opinion, the roseate vision of an enthusiast; something possible, perhaps, in the misty future, but not to be thought of as a reality in the present.

A few weeks ago, on Saturday, May 3, a trial trip was made with two new electric cars, the property of the Twin Falls Railway Company, from Twin Falls

to Buhl and return over that new line. The round trip of 34 miles occupied about 70 minutes of actual running time. The cars used are the first to be purchased by the Perrine-Hollister Company, and are a guarantee that the projected line is no longer a dream. Motive power is furnished by the Edison storage battery system, which has been brought to a stage of economical perfection. So far as the power is concerned it would doubtless be cheaper to utilize that generated by the power house at Shoshone Falls, but this would require the erection of poles and wires at a practically prohibitive cost. Under the storage battery plan no poles or wires are necessary. The trial trip to Buhl, in which some 90 people participated, was made over the rails of the Oregon Short Line, the electric cars being of standard gauge.

From Twin Falls to Shoshone Falls is a distance of approximately six miles. Rails are laid to a point well beyond the limits of Twin Falls, and the road bed is graded for the entire distance. The laying of rails on the rest of the road will be advanced as speedily as possible. In order to bring as much of the country as possible within reach of the new road, connection between Twin Falls and Shoshone Falls is laid out in the form of a loop, the cars to run out one way and return another. There is no financial or managerial connection between the Short Line and the electric road. The trial trip was made over the tracks of the former as a matter of courtesy, the electric people not having enough of their line completed to furnish a fair test of the new cars.

This is the beginning of an electric railway system with which it is proposed to bring all parts of the Twin Falls country into close and economic communication. It is illustrative of the progressive spirit which dominates that section of Idaho.

MAIL BY FREIGHT.

From Popular Mechanics.

It is greatly to be hoped the new postmaster-general will in the near future reverse the action of Mr. Hitchcock, who was responsible for sending large quantities of mail by freight. For many years the policy of the Postoffice Department was to expedite and improve the transmission and delivery of mail. It remained for Mr. Hitchcock, in the exercise of the wide personal power vested in the postmaster-general, to take the first decided step backward.

His scheme, which he excused on a claim of economy, was to send some of the second-class mail by freight trains part of the distance and then transfer it to a mail train for the remainder of the trip. For instance, second-class mail originating in Chicago, and addressed to subscribers in the southeastern states, was taken by freight to Cincinnati. Later haul by freight train was extended to Atlanta before getting mail-train service. The result was what might have been predicted and publishers have been busy ever since

trying to explain to disgusted readers why their magazines failed to come. A single recent example in own own case was sixteen mail sacks of Popular Mechanics Magazines for the southeastern states which were lost at some little flag station and did not turn up for more than two weeks.

Another feature not approved by lovers of fair play was the autocratic manner with which the postmaster-general assumed to himself the province of both court and jury and designated which publications should go by freight and which should still enjoy the former fast-train service. It is certainly no more than plain justice that all publications entered under exactly the same conditions and requirements as mail matter of the second class, and



HONORABLE FRANKLYN KNIGHT LANE.
Secretary of the Interior.

The accompanying half-tone shows a good likeness of our secretary of the Interior, Honorable Franklyn Knight Lane, who was formerly engaged in the practice of law in San Francisco. Secretary Lane was appointed a member of the Interstate Commerce Commission in 1906. He has a big job on his hands in taking care of the Interior Department, and his friends hope for excellent results from his administration.

all paying exactly the same rate of postage to the Government should each receive the same service. To grant some the favor of fast-train service and consign others to the handicap of freight trains, and that at the caprice of one cabinet officer, is at least un-American; especially as the postmaster-general is his own court of last resort on his own rulings, and the publisher has absolutely no appeal.

It is conceivable that such a condition might exist in Russia, but, of all places, not in the United States. The hope is again expressed that the new head of that greatest business department of the government will in his own good time investigate this rank abuse and deal justly.

ALFALFA.

HARVESTING FOR HAY.

By Rupert L. Stewart,

Assistant in Agronomy, New Mexico College of Agriculture.

Forage crops suffer both in yield and quality if harvested too early or too late. Much damage is done, also, when too much or too little time is given for curing. Alfalfa is especially susceptible to mistreatment because the leaves may be lost, the color spoiled and soluble nutrients lost by a little neglect; and it pays good returns for care owing to the high price of a first class product. First class alfalfa hay has fine stems, many leaves, and a bright, pea-green color.

If the alfalfa has made a rank growth it will be found necessary to harvest at an earlier period than if it has grown slowly. Rank growth means coarse hay. This is why the second cutting of hay is usually coarser and not as good in quality as the first cutting. If the alfalfa is allowed to stand too long before cutting the lower leaves will turn yellow and fall and the part that the hay buyer most desires is lost. Likewise failure to harvest at the proper time causes the hay to lose some of its color and instead of having the desired pea-green shade it will have a brownish cast. If cut too green it is apt to heat and a less amount of nutrients will be obtained. Our experiments show that the best results are obtained when the alfalfa is cut when it is in about one-eighth bloom. With the basin system of irrigation a mower of more than five-foot cut seems impracticable.

As soon after cutting as possible the hay should be gathered into wind rows with a horse rake. This should not be done, however, until it will dump without "hanging" or clinging to the rake teeth. Under ordinary circumstances not more than twelve hours of sunshine are necessary. The hay should not lie in the wind rows for very long, but should be put into cocks of medium size and there left to cure until ready to bale. In this way the hay is well cured and gets very little bleaching by the sun. The time that the hay should be left in the cock will depend upon the condition in which it was cocked. It must be sufficiently cured so that it will not shrink or mould. The hay should break readily when a bunch is taken in both hands and twisted.

Baling in the field from the cocks seems to be the most economical and satisfactory way to care for the crop. Fewer tools are needed, only a bull rake being required, and the hay is less handled thereby insuring the least loss of leaves. The bales should be put under a good cover immediately, as they will be greatly damaged by rains if exposed.

The output of the Nampa Co-operative Creamery, a farmers' organization on the Boise project in Idaho, is increasing rapidly.

SUBSCRIBE NOW!

No one interested in Irrigation can afford to be without THE IRRIGATION AGE: 480 pages of reading matter per year for only One Dollar.

SANITARY FLOORS FOR THE DAIRY BARN.

Method of Laying Concrete Floors With Farm Labor.

In the voluntary movement of farmers for *better milk at better prices*, the first step toward improvement is the making of the barn more sanitary by laying concrete floors. The method is so simple that any man can do his own work. The cost is so small and the cash returns are so great that the floors soon pay for themselves in preventing the breeding of flies, in the saving of liquid manure, in the reduction of labor, and in the increased flow and improved quality of milk. The plan described below is for a barn in which the two rows of cows stand heels toward each other, with a driveway between. It is easily modified to the opposite arrangement. Likewise the method is adaptable to both old and new barns.

PLANNING AND GRADING THE FLOOR.

For average conditions lay out the stalls on 3-foot 6-inch centers and 4 feet 6 inches in length from 6-inch manger wall to drop gutter. The manger is 2 feet 6 inches wide at the top and 2 feet at the bottom, with one face sloping up to the feed-alley floor. The depth is 7 inches, measured from the stanchion setting, and 8 inches from the alley floor. The feed alley is 4 feet 6 inches wide. The drop-gutter has a width of 18 inches. It is 8 inches deep gauged from the stall floor, which is 2 inches higher than the 8-foot driveway. For establishing trade lines a carpenter's spirit level (or a water level) and a chalk line are very helpful.

To prevent possibility of the floor settling, remove all manure before grading the surface of the carthen floor. Carefully tamp back the dirt around water pipes and the drains which carry waste water and liquid manure to the water-tight concrete manure pit. Do all filling as long as possible before building the concrete floor. As a foundation for the stall floors

named, the feed alleys, the driveways, the mangers and lastly the gutters.

MIXING AND LAYING THE CONCRETE.

For the plan given, 5 feet 6 inches from the center line of the driveway stake on edge (and to line and grade) a 2 by 12-inch plank, to serve as a form for the stall floor at the gutter. Likewise set a similar board, 5 feet distant, to mold the 6-inch manger wall and stanchion setting. Bear in mind that the stall floor has a slope of 1 inch toward the gutter and



Sanitary Floor With Concrete Manger and Swinging Stanchions.

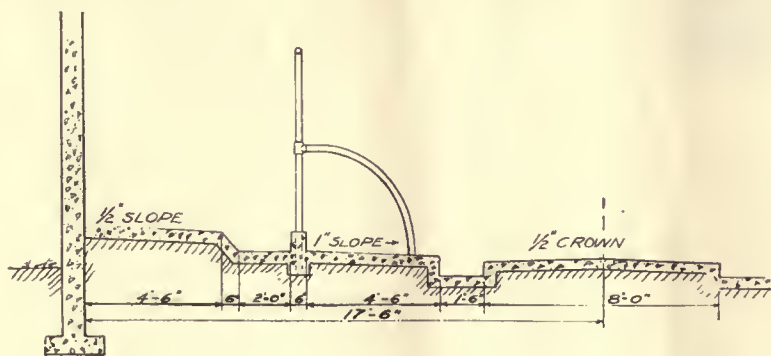
that the stanchion setting rises 7 inches above the stall floor. Drainage for gutters and mangers will be provided by sloping their concrete bottoms.

Proportion the concrete 1 bag of Portland cement to $2\frac{1}{2}$ cubic feet of sand and 5 cubic feet of crushed rock, or 1 bag of cement to 5 cubic feet of clean pit gravel. At one operation lay the full 5-inch thickness of the stall floor and finish three stalls the same as one section of sidewalk. No surfacing mortar is needed. For setting patented stall divisions, follow the manufacturer's directions; for home-made divisions, make mortises by tamping the concrete around greased tapering wooden cores, which are withdrawn as soon as the concrete stiffens. A wooden float is best for finishing the floor. A steel trowel yields a surface entirely too smooth, and such a finish should always be roughened by brushing with a stable broom.

While the concrete of the three stalls is still soft, mold the stanchion setting (6 inches thick) upon it. As forms use the projecting 7-inch height of the 2 by 12 piece already in place and two 1 by 6-inch boards toe-nailed together so as to provide another 7-inch height and a bearing plate to rest on the green concrete. These forms may be made dish-shaped for swinging stanchions. Fill the forms with mushy wet concrete, trowel the surface, round the corners, and set the stanchion holders.

Repeat the operation until all stall floors are completed. The feed alleys and driveway are easily built: they are merely rough-finished sidewalks. Place the waste-water outlets in the mangers at intervals of 28 feet and give the bottom a slope of 1 inch toward

(Continued on page 254.)



Cross-section of Concrete Dairy-Barn Floor Showing Usual Dimensions.

proper, place a 6-inch thickness of coarse broken stone or screened gravel to keep the floor from direct contact with the ground. Since the stall floors are of prime importance, it is well to make them first. During this operation the unpaved driveway and alleys can be used as working space. Then finish, in order

THE WEST IN MINIATURE.

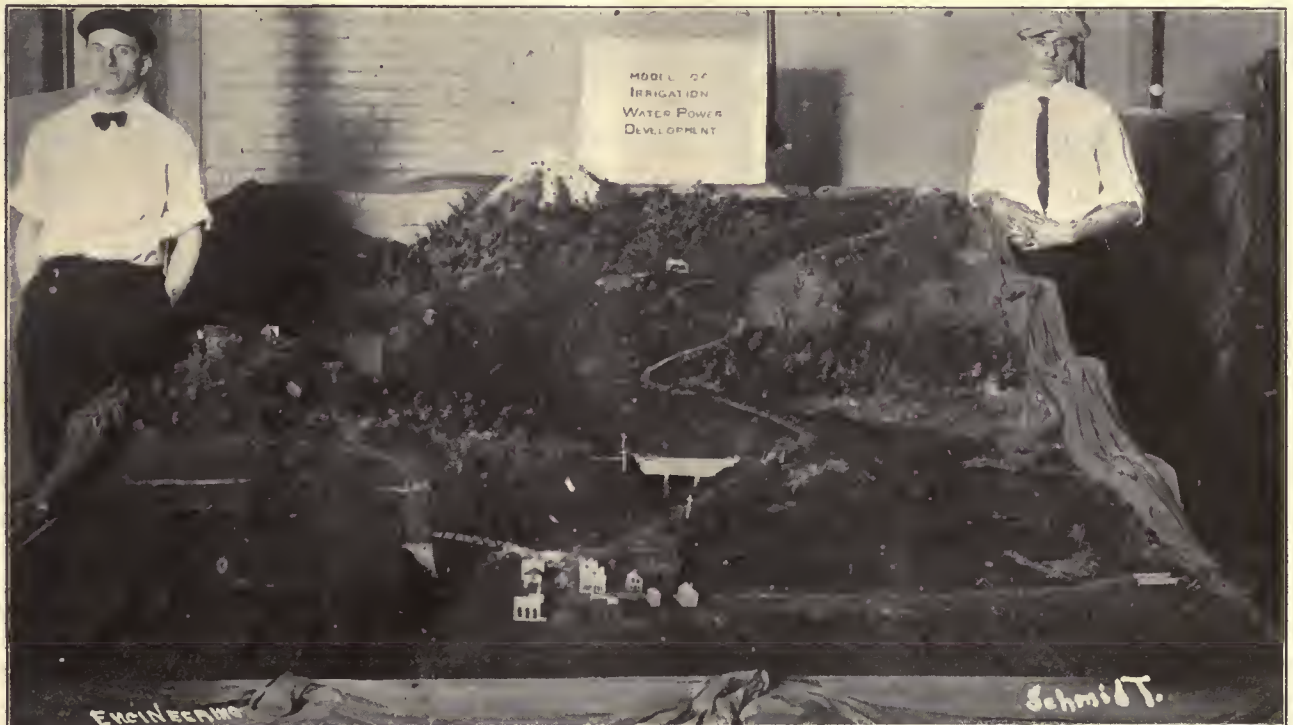
Conda J. Ham.

A great section of the west, with snow-capped mountains, forests of pine, lakes, artificial and natural, a river, systems of irrigation canals, great sections of farm lands, and many other interesting features were pressed into a space barely fifteen feet square in a miniature irrigation model exhibited at the recent engineering exhibit at the University of Michigan. People who attended this exhibit, many thousand of them, there saw at a glimpse the enormity of many of the problems confronting the hydraulic engineer and forester, or irrigation specialist. The work was all done by students of these subjects, under the direction of Professor Clarence Johnston, and his assistant, Professor Horace King.

An irrigation canal flowed out of this lake through a tunnel to irrigate the farm lands in the foreground. As it approached the river which had cut a deep canon through the mountain side, the canal was divided, a part of the water being kept on the left side of the river and the balance being flumed across the river by a concrete flume and used to irrigate the lands on the opposite side. So well was this model constructed that all of the lands in the foreground were evenly moistened all of the time, yet at no time was there any surplus water standing on them.

Three kinds of irrigating methods were represented, viz., the check, and the flooding methods, used for grains and hay, and the furrow method used where such crops as corn, potatoes, and all that are grown in furrows are raised.

Besides the irrigation and power features of the



Model Irrigating Plant at University of Michigan Engineering Exhibit.

While the model represented only an ideal irrigation system, there were features of it drawn almost exactly from real life. In the background was a mountain range with peaks rising above the snow line. At the right hand corner of the model was a lake modeled after Crater Lake in Oregon. From this lake a river flowed down the entire mountain side. Part way down the mountain was located a power-house operated by the fall of water from the lake. From it a line conducted the power to the village in the foreground.

The surplus water flowed into another lake formed by a dam at the left of the model. This dam and the surrounding territory are exact duplicates of the Crystal Lake dam, in the Laramie Mountains of Wyoming, constructed during the time Professor Johnston was acting as a hydraulic engineer in the west, and of the territory which surrounded that dam.

model, other interesting engineer methods were shown. There was a system of mountain roads, different types of bridges across the river and irrigation canals, various types of houses and features of forestry in mountain districts. To people who have never made a special study of western methods, and to those who had never viewed such a system in operation, the model was most instructive.

J. M. Morgan is experimenting with a new means of irrigation on his place near Osborne, Kan., this year which so far appears to be a great success. He makes a tile for subsoil moisture by nailing four laths together making a square box and lays them eight to fourteen inches under the surface of the ground. The water is pumped into the lath tiling the same as in earthen tiling and it seeps gradually into the earth doing the same good as clay tile. This plan is much cheaper.

ALFALFA INOCULATION TESTS.

By C. W. Pugsley.

Agricultural Experiment Station, Nebraska.

During the winter of 1909-10 an effort was made to secure co-operators among the farmers of Nebraska to test the value of inoculating newly seeded alfalfa fields. This investigation was suggested by reports received from correspondents during 1909. The names of farmers willing to co-operate were secured by correspondence and by conferences at the various Short Courses held during that year.

In the spring of 1910 about thirty-five farmers, located largely near Broken Bow, Cambridge, Franklin, and Blair, agreed to test the effect of cultures sent by the United States Department of Agriculture, soil from well-established alfalfa fields, and farm manure in securing stands of alfalfa and on the subsequent growth.

The weather conditions were very unfavorable and it was thought advisable to repeat the tests in the spring of 1911. If anything the conditions were more severe the second year. The difficulty experienced was because of extremely dry weather and a large number of grasshoppers. Many of the farmers applied the soil and used the culture but reported in July and August of each year that the crop was entirely dead.

From the thirty-five co-operators we have only twelve reports to indicate the effect of these treatments. The tests should by all means be continued for a number of years, and should cover all sections of the state. The reports in this bulletin cover seedings

measurement of the ground, application of culture, soil and manure, and such other details as were necessary. Wherever it was thought advisable, a man was sent from the Experiment Station to assist in locating the plots and in applying the various treatments. The plots were located in such a manner that there would be no wash from inoculated to uninoculated plots and in such a position that the soil would be as uniform



Fig. 1. Alfalfa Roots.

as possible.

To assist in the proper interpretation of the results, the following were asked each co-operator:

How was ground prepared on which the alfalfa was seeded?

What crops were grown on the ground for the five years preceding?

Was it ever seeded to alfalfa before? If so, when?

Ordinarily is there trouble getting a stand in the neighborhood?

Was culture used? On how large an area?

Was soil from an old alfalfa field used? On how large an area? How much?

Was soil from a sweet clover patch used? On how large an area? How much?

Was barnyard manure used? On how large an area? How much?

How was alfalfa seeded? How much seed per acre? When was it seeded?

The answers to these questions were received about the first of August of each year. Many of them read: "Grasshoppers killed the alfalfa," "Dry weather killed the alfalfa," "So poor a stand that I plowed up the patch, due to the dry weather."

The co-operators were visited in the summer of 1910 and the late summer of 1911, by representatives of the station. Each field man carried a notebook in which he collected data concerning the soil, preparation of plots, and seeding.

The following table shows results secured by twelve co-operators, as recorded in letters from the co-operators and in notes taken in the field:



Fig. 2. Inoculated portion of the field to the left. Uninoculated portion to the right. Farm of C. S. Martin, Custer County, Nebraska.

of 1910 and 1911 and observations during the year 1912.

The method of conducting the tests was as follows: The co-operators were asked to sign a statement promising to carry out the instructions given by the station and to keep a record of all the field operations. Instructions were sent them as to seeding,

Name	County	Year	Results
W. E. Cobb.....	Custer.....	1910	Culture and soil gave good results.
L. S. Crawford...	Franklin....	1910	Treatment good, especially top dressing with manure.
J. L. Will.....	Franklin.....	1910	Manure beneficial.
Edgar Graham....	Custer.....	1910-11	Manure beneficial.
Winchell Marisch..	Boone.....	1910-11	No results from culture.
F. F. Martin.....	Washington..	1910-11	No results from culture. Manure valuable.
R. M. Lemons...	Holt.....	1910-11	Treatment good, especially manure.
F. A. Hangman...	Furnas.....	1910-11	No difference.
R. Barrett.....	Custer.....	1910-11	No difference.
J. D. Ream.....	Custer.....	1910-11	Manure of great benefit.
C. S. Martin.....	Custer.....	1910-11-12	Soil treatment best. Culture of benefit.
J. T. Cole.....	Custer.....	1910-11-12	Soil treatment best. Culture of benefit.

From the notes which were brought in by the field men, and from the blanks which were filled in by the co-operators, it was apparent that the best stands were secured on the fields which had received in previous years farm manure and careful cultivation, or where a leguminous crop had been previously grown. Better results were often secured from fields to which farm manure had been applied at the time of seeding, or during some previous year, than from fields where farm manure had never been applied. This, of course, does not mean that a heavy application of coarse manure plowed under, in the western part of the state during dry years, would give any advantage for that season at least.

From the notes taken June 21, 1911, on the farm of Mr. J. T. Cole in Custer County, the following is quoted: "Alfalfa much better where inoculated, especially where soil was used. Could see the difference all spring. Made one-half more hay than ground not inoculated."

The following letter, dated July, 1912, from Mr. W. E. Cole of Custer County is of interest:

"I can see little difference in the three plots [liquid treated, soil treated, and no treatment] at the present time, but I do think that either the liquid culture or dirt from an old alfalfa field is a great help in securing a stand, especially in a dry time. It seems to have more vigor and will stand more abuse. I think the soil from an old alfalfa field is as good as anything."

From the notebook of one of the field men, dated June 22, 1911, we find the following in reference to the field of Mr. C. S. Martin in Custer County: "Where dirt from the old field was spread, there is a good stand. Where the Government material was used, the stand is just fair, and in places none. No stand where no treatment was given. Very favorably impressed with the use of inoculated soil."

Figure 1 is of the plots from the farm of C. S. Martin of Custer County. The portion to the left is the edge of the area that was inoculated with soil from a well-established field of alfalfa. The portion to the right is the plot that was not inoculated.

A letter from C. S. Martin dated July, 1912, contains the following: "From the test I got with the liquid inoculation, I do not think there is much to be expected from it. I tried some ground at the same time with soil taken from an old alfalfa field, and I feel that the results were much better than they were on the ground treated with the liquid. I did not get a very good stand on either one of the places, but it was much better where I used the soil from the old alfalfa field.

All seed was tested both years for per cent of germination and purity. If either were low the farmer was notified and new seed secured. The average of all samples used showed a germination test of 76.8 per cent and a purity test of 93.12 per cent.

Figure No. 2 shows alfalfa nodules of different sizes. If alfalfa does not make good growth, appears light in color, and lacks general thriftiness, an examination of the roots should be made. Carefully dig up a plant with considerable soil adhering to the roots. Wash the soil from the roots by gently pouring on water, or by immersing in a pail of water and allowing the soil to soften and fall from the roots. If nodules are present, the trouble is not from lack

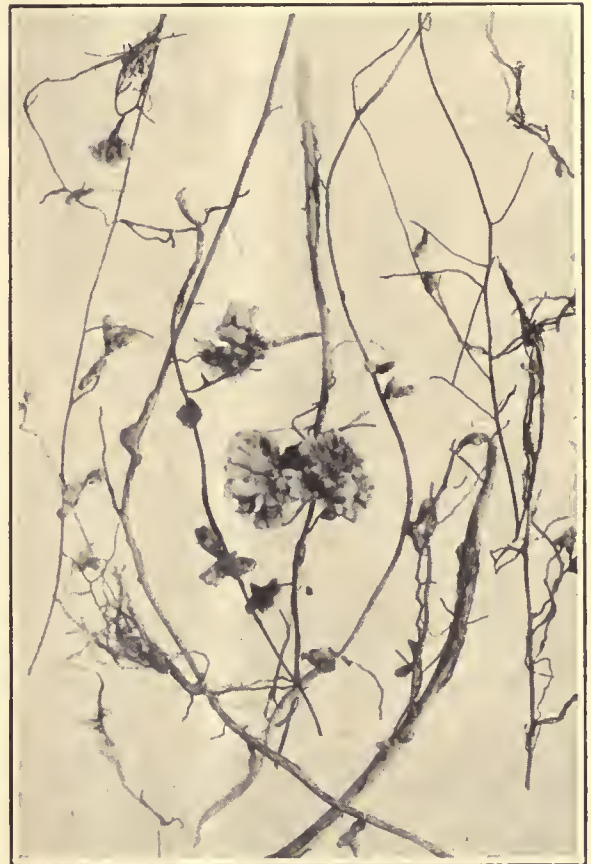


Fig 3. Alfalfa Nodules.

of inoculation. It is sometimes impossible to find nodules in the surface soil in the winter or during a dry period, even though the field may be thoroughly inoculated.

The following quotation from Bulletin No. 120, on "Alfalfa Management," published by this station bears on the matter of inoculation and may well be repeated in this connection:

"The results of co-operative tests during the past two years with cultures of bacteria have shown that in most instances artificial inoculation is not necessary to the production of a good crop of alfalfa in Nebraska. In localities where alfalfa has been suc-

*The data for 1909 were lost in the transfers of men in charge of the department.

(Continued on page 256.)

A SETTLER'S EXPERIENCE IN THE IRRIGATION AREA OF THE STATE OF VICTORIA, AUSTRALIA.

By Thomas Bunbury—Ballendella, Victoria, Australia.

ARTICLE NO 2.

The writer in sending this, the second article on Victoria, cannot do better in the first instance than confirm number one, as he fails to find any reason to alter any representations made therein, as in all cases any apparent destructive criticism must eventually be overcome by honesty of purpose, and this is applicable not only to the members of any government collectively and individually, of this or any other country. Having in number one started the new settler on a Block, with a capital of \$2,000, and after expending it to the best and most necessary advantage, left him with \$430 in the bank and an assured income from cows, which when estimating it might have then been stated that such income included butter, milk and cream, which might be used by his household, and it would be only also right to add as well the profits made by calves and pigs. Out here the latter are almost fed solely on separated milk and thrive well on it. Young pigs are bought at about from \$1.50 to \$3.00 and kept between three and four months and sell at from \$12 to \$18 each.

A settler arriving in Victoria about March, the following would be about the class of work he would have to do for a start: The first thing will naturally be to fence in his holding, and if need be, dig a water tank and see to getting his house built. Of course, it might be that all this had already been done. Meanwhile, if it were not, he would live in tents. The next thing to do would be to get his land in order for crops of all kinds. Alfalfa is generally seeded in August or September; the land will have to be got thoroughly into order by plow, harrow, grader, etc.; the distributing water channels will have to be dug according to the levels of his land. This latter is an important item so that when the time for irrigating comes no delay will occur in taking and using the water, which it must be remembered, is a compulsory charge upon his property.

It may be that when the settler arrives good rains have fallen and his land plentifully supplied with natural grass feed. This being the case, he might, with safety, start and buy his cows right away, but should that not be the case, it would be better to wait a bit and get in with his plow and start seeding such crops as oats, barley and peas, and field peas at once, in say from three to five-acre plots, and fence off accordingly. Oats and barley can be grazed out here several times and then give a splendid crop; meanwhile the barley and peas and the field peas will be coming along so that when the other crops are done grazing with they can be cut with the mower and fed to the cows. On no account can anyone depend upon the natural grass feed for cows. At first, of necessity, it may be all right, but as time goes on and things become more ship-shape, it will be found that there won't

be any room for such a commodity. The hot winds and dry weather soon do away with the grass, and it is therefore absolutely necessary to make sure of stock having plenty of feed—the more varied the better. Alfalfa seeding commences here about August; rain comes about that time, but failing rain, the irrigation water will be there, and after a good irrigating it can be seeded and in a very short time germination begins, and given good weather its growth here is remarkable. A cutting should be obtained about November, and it is quite safe to reckon on four to five tons per acre in the season.

Grazing of alfalfa is not much gone in for any way; it is not advised as wisdom on the first season's growth, but when established many settlers do so, dividing what they may have into small paddocks. One great danger which arises from grazing is that cows are liable to bloat from it; that is, they get suddenly filled or blown up with gas, and die in a very short time unless remedies are immediately applied, and which, if at hand, have proved cures, such as carbonate of soda, kerosene and Stockholm tar. While on the subject it would be very interesting to note if the above occurs on the alfalfa fields of America, and if so, what remedies have been found there to be the most effective.

The writer is of the opinion that when alfalfa is firmly established, fenced off into small paddocks and grazed in rotation, the cows get sort of acclimatized to it and are not so liable to bloat, but if they are taken off it for a period and then are put on it when hungry, and it be wet from either dew or rain, the danger then seems to be doubly accelerated. Horses are not affected, but sheep frequently are. The surest safeguard is to carefully watch one's stock, and put them off at once when such symptoms appear.

Sugar beet thrives well here and is generally seeded in August and becomes fit for use in the following March and April when other feed is getting scarce and alfalfa on the wane, though this season the latter is still growing merrily. Of course, weather conditions have to do with this and all other kind of crops. Maize can be put in about the end of October, also millet, sorghum and amber cane. Opinion here is that millet is a better milk producer than maize. Sugar beet as feed has not yet been given a fair trial, but the writer hopes to try it this year.

Potatoes here will give two crops in a year—the first may be planted in January, to mature about April, and the second in August, to mature in December. Some settlers last year had splendid crops, which no doubt this year will be surpassed, as an early crop means money. Last year they went up to \$125 per ton.

Vegetable seeds of numerous kinds can be planted here every month of the year. Tomatoes put out early also bring good returns, and many settlers have done well with early tomatoes, cabbages, peas and French beans. They always command a good sale and prices when grown for the early markets.

The planting of orchards is greatly on the increase here. Apples, pears, apricots, etc., are planted
(Continued on page 257.)

Supreme Court Decisions

Irrigation Cases

RIPIARIAN RIGHTS.

Since the flood waters of a stream do not come within the protection of the law of riparian rights, a riparian owner is not entitled to claim them against an appropriator on the theory that the riparian owners may at some indefinite future time determine to construct a reservoir on their lands to impound such flood waters for use during the dry season. *Gallatin v. Corning Irr. Co.* Supreme Court of California. 126 Pacific 864.

IRRIGATION BONDS.

Under L. O. L., § 6184, authorizing the directors of an irrigation district, without offering its bonds for sale to the highest bidder, to use them at par for the purchase or construction of reclamation works, the taking over of property upon delivery of the bonds at par, under a void agreement, would be legal and valid. *Board of Directors of Payette-Oregon Slope Irr. Dist. v. Peterson.* Supreme Court of Oregon. 128 Pacific 837.

AJUDICATION OF PRIORITIES.

In contests involving the adjudication of the rights of rival appropriators of the waters of a river, the Board of Control had no power to determine as between the parties the ownership or right to the use of a ditch; the board's duties being confined to the distribution of waters between the several appropriators, the granting of permission to use such waters for beneficial uses, to grant certificates therefor, and general supervision of such waters. *Collett v. Morgan.* Supreme Court of Wyoming. 128 Pacific 626.

RIPIARIAN RIGHTS.

While one may maintain either his riparian right or his right as an appropriator, he cannot claim title to water in both characters, the assumption of one being the abandonment of the other, hence one claiming 500 miner's inches of the water of a stream, and attempting to enjoin others from in any way hindering the entire flow, will be held to be asserting rights as an appropriator by which alone an exclusive use can be had, and not as a riparian proprietor. *Bowen v. Spaulding.* Supreme Court of Oregon. 128 Pacific 37.

RESTORATION OF WATER DIVERTED.

An upper riparian owner cannot be enjoined by a lower owner from diverting water until the former shall construct an intake, headgate, canals and ditches, and a return ditch for surplus water, so that the diversion may be made without unnecessary waste, where by agreement with such lower owner the surplus water of the upper owner was turned into the lower owner's canal, as the rule requiring the return is for the benefit of and may be waived by the lower owner. *Biggs v. Miller.* Court of Civil Appeals of Texas. 147 Southwestern 632.

RIGHT OF JUNIOR APPROPRIATORS.

As a junior appropriator of water to a beneficial use has a vested right against his senior to a continuation of the existing conditions, the senior appropriator, though entitled to a large flow of water for the irrigation of a small area which lies so close to the

stream as to permit return of the water, cannot change the point of diversion so as to take the entire amount of water to irrigate a larger area so far away from the stream as to prevent its return. *Larimer County Canal No. 2 Irrigating Co. v. Poudre Valley Reservoir Co.* Court of Appeals of Colorado. 129 Pacific 248.

DEDICATION OF WATER TO PUBLIC USE.

Where an irrigation company which appropriated water from a river to irrigate a named county, organized subsidiary corporations for the purchase of the land in that territory, and transferred to them perpetual water rights for the irrigation of land owned by them, there was no dedication of the water right to public use; the essential feature of a public use being that it shall not be confined to privileged individuals, but open to the indefinite public, while in this case not every landowner could use water. *Thayer v. California Development Co.* Supreme Court of California. 128 Pacific 21.

FAILURE TO FURNISH WATER.

Two of the plaintiffs, being owners and holders of a water right upon which they were entitled to water from defendant's canal for irrigation, leased land to the other plaintiff and agreed to furnish him water for irrigation thereon. The tenant duly demanded that defendant furnish the water under the water right, and defendant refused, apparently contending that the water right was for some reason invalid, but made no objection that the holders of the water right had not assigned the same to their tenant or authorized him to demand and use the water thereunder. Held that, after action was brought for damages caused by refusal to furnish any water under the water right, the defendant could not defend against the claim of the tenant on the ground that his landlords had not authorized him to use the water right, and, the rent being payable in kind, the landlords and tenant were owners in common of the crops and could maintain a joint action for damages thereto. *Chalupa v. Tri-State Land Co.* Supreme Court of Nebraska. 138 Northwestern 603.

RECLAMATION ACT.

Under the provision of Reclamation Act June 17, 1902, c. 1093, § 6, 32 Stat. 389 (U. S. Comp. St. Supp. 1911, p. 666), authorizing and directing the Secretary of the Interior to use the reclamation fund created by the act "for the operation and maintenance of all reservoirs and reclamation works constructed under the provisions of this act, provided that, when the payments required by this act are made for the major portion of the lands irrigated from the waters of any of the works herein provided for, then the management and operation of such irrigation works shall pass to the owners of the lands irrigated thereby, to be maintained at their expense," etc., and especially in view of the provision of section 4 that the charges against the land which the secretary is authorized to fix and collect in annual installments "shall be determined with a view of returning to the reclamation fund the estimated cost of construction of the project," the secretary has no authority to make additional annual assessments for the cost of maintenance prior to the time when the management passes to the landowners. *Baker v. Swigart.* U. S. Circuit Court of Appeals. 199 Federal 865.

Reclamation Notes

COLORADO.

Electric power, at a cost of \$1,130,000, to water land, which will be worth, when it is irrigated, between \$7,000,000 and \$8,000,000, embracing 125,000 acres in Weld county, Colorado, is the plan of the Greeley-Hydro-Electric Company, which has filed condemnation suits in the district court of Weld county, to secure sites for reservoirs in the mountains west of Fort Collins, Colorado.

Reports from Morgan county, Colorado, state that the outlook for prosperity in that county this year is the brightest in its history. There is an abundance of water in every district, and the soil is in the finest condition as a result of fall irrigation and severe freezes and thaws during the winter. A greater acreage is under cultivation than formerly, and farmers are all busy and well pleased with the outlook.

It was recently stated at a meeting held in Denver, to discuss the matter of the tunnel for the Moffat Road, the new line which is at present running from Denver to Steamboat Springs, the intention being to extend it to Salt Lake City, that the opening of this line to Salt Lake City would give Denver a direct outlet to the coast and bring 5,000,000 acres of irrigable land in Routt and Moffat counties and in eastern Utah to the doors of Denver. It was stated that there are now 16,000 settlers along the survey who have 300,000 acres of land under irrigation, and this land will immediately become tributary to Denver.

Irrigationists throughout the state of Colorado are watching with interest the experiments being carried on by the Irrigation Department of the Agricultural College, at Fort Collins, with a new kind of porous tile manufactured by a Colorado concern for sub-surface irrigation. This tile is composed of cinders, clay, sawdust and other materials, so treated by chemicals as to make it very porous. It is laid from 18 to 24 inches beneath the surface, and is joined together with cement. Water is sent through the tiling under pressure, and it slowly filters out into the soil where it is drawn to the surface by capillary action. This method is held by many to be more efficient than surface irrigation.

The burying of peach orchards for protection against late spring frosts is a common practice, so an eastern exchange states, in the intermountain fruit valleys of eastern Colorado. In areas where not more than one full crop in seven or eight years has been previously harvested, annual yields are now to be counted on, and our exchange states that a net return of \$25.00 from each peach tree is not uncommon. Irrigation facilitates the work of burying the trees. Just before a hard freeze is due in the late fall, the Colorado orchardist digs a trench to the

peach tree which he expects to "lay down," and then turns on the water, allowing it to run until the soil about the roots is thoroughly soaked. He can then undermine the trees, and bend them down with little difficulty. They are held to the ground by a heavy plank or by ropes until a covering of hay is spread over them, and a layer of dirt is spread over that. It is stated that two inches of dirt has been found sufficient protection in thirty degrees below zero weather.

It is reported that the Antero Project in Colorado will be completed June 15th if the present rate of work is kept up. This project was financed by the Dougherty Company, of New York, who are also figuring and are having surveys made for the Dolores Project in western Colorado.

With the advance of \$1,000,000 by the Franco-American bank for the refinancing of the Denver Reservoir Irrigation Company, the amount which this great bank has represented in investments tributary to Denver approaches \$5,000,000. This large sum, according to well founded reports, is the beginning of the flow of French capital into Colorado development projects of a solid character.

Horace P. Bennett, financier and real estate man, has turned gentleman farmer, and Wolhurst, suburban home of Wolcott, and later of Thomas Walsh, has become the model farm of the west. This ranch is located south of Denver, and the original 500 acres owned by Senator Wolcott has been expanded into 5,000 acres, and has been equipped with a flawless irrigation system.

A contract was let recently to the Saylor Construction Company of Lamar, Colorado, for the completion of the Seledge extension of the Gunnison irrigation project that is under way by the government. The contract price is \$100,000, and the work will be started at once. It is expected to have it completed by the late fall.

This extension will bring water to about 10,000 acres in Delta county.

California people are agitating a suit to prevent the diversion of water from the western to the eastern slope in Colorado.

Senator Shafrath, of Colorado, recently pleaded with Secretary Lane at the Interior Department Reclamation hearing, in Washington, to sue the people of his state. The Senator purposed in this way to get a determination of the government's right to use the waters of the Rio Grande to fill the Engel Dam for the irrigation of 20,000 acres in Mexico, and 160,000 acres in Texas and New Mexico. Senator Shafrath contended the people of Colorado had a right to construct reservoirs to store the waters which otherwise would fall into the Rio Grande, and that the government had no authority to stop that for the benefit of the Rio Grande Project in Texas, New Mexico and Mexico. Senator Shafrath is supported by public opinion in Utah on his stand.

UTAH.

Dr. E. G. Titus, Entomologist for the State Agricultural College, visited Lehi recently in connection with some experiments that Utah is making in an effort to control the ravages of the alfalfa weevil. During the winter, at the Saratoga Springs, experiments were made with winter irrigation. The Doctor will know in a short time whether covering the alfalfa with a coat of ice will kill the destructive pests. It is stated that the Saratoga alfalfa appears to be advanced over any similar crop in that vicinity. Dr. Titus is also conducting experiments at Lehi, with fall cultivation, and hopes to prove that stirring the soil after the weevil has hibernated in the fall will help in their destruction. In any event, cultivation will stimulate the alfalfa growth the following season.

F. H. Abbott, acting commissioner of Indian affairs for Utah, has issued a statement in which he sets forth the advantages of the Uintah basin and the opportunities offered to settlers there. Under the law, beneficial use of the water for irrigation must be made before 1919, the water to irrigate 78,000 acres which is now under ditch belonging to the Ute Indians. In order to develop the land, leases will be granted to 1,000 white persons within the next two years, the leases to be on liberal terms and for five years, according to the statement.

The Blue Mountain Irrigation Company, of Monticello, San Juan county, Utah, has been organized with a capital stock of \$15,000. A. H. Barton is president; F. I. Jones, Vice-President; F. P. Jones, Secretary and Treasurer.

At a meeting recently held at the Commercial Club, in Salt Lake City, the subject of the best practical means for the conservation of water was discussed. It was demonstrated by experts that the customary application of water to the lands in agricultural operations in Utah is beyond any real need. In fact, is beyond the best use of the water, and it was clearly proven that less water would be better for the crops, and would eliminate altogether the overflow and the destruction of low lands by floods from over-irrigation.

Utah farmers, in Utah county, state that there are about 10,000 acres of land in Utah lake bottoms that are completely covered with water as the result of the damming up of the mouth of the Jordan River. This will ruin thousands of dollars' worth of crops for the farmers in this section, and will do material damage to the potato crop of Utah county, as a large percentage of this acreage is planted to potatoes. Farmers who are affected say that they will bring suit against the Salt Lake Irrigation companies for damages.

Word reached us from Ogden that it will be an impossibility to impound sufficient water this season for irrigation purposes, and that nearly all the work on the storage reservoir and dam in South Fork canyon has been suspended. Operations will not be resumed until Engineer Craven has completed his estimates of the work finished by the Ogden River Reservoir Company.

OREGON.

Judge Will R. King, of Portland, Democratic National Committeeman for Oregon, has been appointed Chief Counsel of the United States Reclamation Service by Secretary Lane. Judge King was Associate Judge in the Oregon Supreme Court, and was first selected to fill a vacancy on the Board of General Appraisers, but at the solicitation of the President and Secretary Lane, he consented to take charge of the Legal Department of the Reclamation Service, a pursuit which King himself felt was more in line with his experience.

The name of the Columbian Reclamation Project will be changed to Tumalo Project.

The Central Oregon Irrigation Company has been granted until September 1st to complete its irrigation project, by the desert land board of Oregon, and the Company asked until January, 1914, while counsel on behalf of the settlers who are affected by the project asked that steps be taken to declare the Company's bond of \$25,000 void.

The Kuhn's, of Pittsburgh, have sent engineers into the country around Vale to investigate and report on conditions there. They have investigated Malheur, Bully Creek, Cottonwood and Willow River valleys, and will present their report to the Kuhn Company at Pittsburgh.

The Willow River Irrigation Project Company's property at Brogan and Jamieson has gone to sale, including their big reservoirs, fruit lands, water contracts and valuable franchises and irrigation sites. D. M. Brogan, after whom the townsite of Brogan is named, backed by capital from Chicago, began the construction of the Willow River Irrigation Project five years ago. Under his management, the project is stated to have been successful in every way, but after a time, other men were placed in charge of the work, and with no knowledge of the science of irrigation much money was expended without accomplishing any practical results.

Umatilla county, Oregon, will, it is stated, add another 20,000 acres to its area of irrigated lands. The plans and specifications recently filed by W. B. Hinkle, Engineer in Chief of the Teal Irrigation district, with State Engineer, John H. Lewis, have been approved with the result above stated. This district lies across the Umatilla River from the United States Government Project.

Activities in connection with the Modoc irrigation project on the Klamath Indian reservation have begun. The engineers in charge of the work are now considering a change in the location of the dam on Sprague River so as to get more fall for the development of power. By moving the dam a short distance up the river, a large amount of water power can be developed.

Preliminary work for a large irrigation project near John Day, Oregon, is well under way. Michael Spears, former county surveyor, is the engineer in

charge. The project contemplates the construction of a dam 150 feet high across Canyon Creek, a few miles above Canyon City. Enough water can be stored in this reservoir to supply 20,000 acres of bench land. The estimated cost of the project is \$400,000.

W. L. Benlam, of Salem, Oregon, has secured a permit from the State Engineer's office to appropriate the waters of the North Santian River for the irrigation of 6,940 acres of land near Stayton. The water will be diverted from the river in section 10, township 9 south, range 1 west.

Water was turned into the main canal of the Klamath irrigation project in April. Some of the farmers in the Bohemian colony in the extreme south of Klamath county requested water. Usually the water is not turned in until the middle or latter part of May. Iron screens have been placed at the intake of the canal so that hereafter no fish will be carried out into the irrigation ditches.

IDAHO.

Traders' or farmers' days was inaugurated in Gooding, Idaho, recently, the purpose being to buy, sell, swap, trade and enjoy a general jollification. Several hundred farmers attended and the day was a success, although not so many were present as expected, due to the fact that the farmers are busy irrigating their crops, less rain than usual this Spring making the ground very dry and in need of moisture. Foot races for fat men, boys and girls and a free-for-all were on the program, the merchants offering prizes for the swift of foot, as well as for the best bread and cake makers. The proposition takes well with the merchants, and another farmers' day will be held in June, the plan being to have one each month.

Senator Myers, chairman of the committee on irrigation, has assured Senator Borah, of Idaho, that he will call a meeting of the irrigation committee with a view of taking up at once the measures which have been introduced by Senator Borah, providing for an extension for the homesteader to make his payments on reclamation projects, and also for the increase of \$30,000,000 to the reclamation fund. These two matters are now pending before Senator Myers' committee, and will be taken up when the first meeting is called.

Idaho is proud of the United States census figures as they speak of the work in that country being well done, and are in other particulars astonishing. Among other features is the fact that there has been an increase of 76.3 per cent in ten years in the number of farms, and an increase of 96.6 per cent in the acreage of improved lands, while the advance in the value of land shows the astonishing figure of 519.8 per cent, while only 9.9 per cent of her land area is now in farms, and only 2.7 per cent of the total land area is under irrigation.

The State Board of Idaho recently agreed to accept the proposal of the backers of the Tom Keeting

irrigation project, composed of 15,000 acres located in Lemhi county, to extend the time for payments to be made by settlers one year longer than the original contracts called for.

Mr. I. W. Arthur Kelly, special land settlement commissioner for the government of Victoria, Australia, has been visiting the irrigated district of Idaho, at the same time giving illustrated lectures on his own country, and showing the irrigation projects which are being opened up there for settlement.

The Bray Lake Reservoir & Canal Company has a new irrigation project to be launched in southern Idaho this year. This company has been incorporated with \$50,000, with five directors—Charles B. Adams, J. R. Butler, Andres Hess, Albert Cronberg, and Harry McGraw, all citizens of Bliss, Idaho.

Maney Bros. Construction Company, of Boise, Idaho, have been granted the Carey act segregation by the State Land Board for reclaiming 40,000 acres of rich land in Jordan Valley, lying immediately south of the town of Jordan Valley, and extending to the Owyhee River. A storage reservoir is to be constructed, the waters for which will be secured from Jordan Creek, Jack Creek and several other streams in that vicinity.

NEVADA.

Humboldt county, Nevada, with 16,000 square miles of territory, offers many inducements to the prospective settler. The easterner can scarcely conceive of the immense size of this county. There are many states in the east whose area is less than that of Humboldt county. The distance from north to south is almost 150 miles, while from east to west it is more than 125 miles. The mountain ranges traverse the county with a north and south trend which are said to be filled with precious metals, as well as the baser ores. The valleys of this county are well watered by numerous springs, streams, and rivers, the Humboldt being one of the largest water courses in Nevada, and the water of this stream is now being extensively utilized for irrigation as well as power.

Recently one of the most important events in the history of Lovelock valley, Nevada, has taken place without ceremony. The waters stored in the great reservoir, by Messrs. Pitt and Taylor, above Humboldt House, were released in the Humboldt River for the first time, two-thirds of the water being used in the Lovelock valley this season for irrigation purposes, being drawn from the storage supply which is calculated to double the acreage under cultivation in that valley. The project is the largest private irrigation development in the state, \$400,000 has been expended by Messrs. Pitt and Taylor in building this reservoir which impounds water that has heretofore gone to waste.

The Register of Deeds, at Carson, Nevada, has received notice from Washington of the approval of the withdrawal of 29,000 acres of the Nevada Irriga-

tion Land and Development Company, at Guyser, Lincoln county. Including the above, the government has withdrawn 106,127 acres in Nevada since February 1st of this year, for reclamation and settlement under the Carey act.

MONTANA.

At the next term of the district court, at Billings, Montana, Judge Pierson will pass on the question of whether or not the John Horne irrigation district as petitioned for by many of the residents in and around Laurel will be organized. The proposed irrigation district will reclaim a large amount of valuable land near that place, and it is expected there will be no opposition to the forming of the district.

The formal completion of the first unit of 8,000 acres under the Prickley Pear valley pumping project of the Montana Reservoir and Irrigation Company was recently announced. Contracts with land owners in the valley near East Helena are now being signed for the reclamation of the second unit of 12,000 acres, and when the project is completed, between 40,000 and 50,000 acres of land will be reclaimed.

NEW MEXICO.

Certificate of incorporation has been filed with the corporation commission, at Santa Fe, for the Portales Power & Irrigation Company, with principal offices at Portales, Roosevelt county. The capital stock is \$300,000, held by the following persons in the following amounts: A. A. Rogers, \$299,800; S. E. Ward, \$100; M. W. Peaslee, \$100.

The fourth irrigation well of the Little Vineyards Company, near Deming, is nearing completion. The standpipe at the headquarters of this company is just about completed and holds 30,000 gallons of water, and taken altogether with the three cement drinking pools in the corrals, gives the headquarters a storage capacity of 40,000 gallons. This company has just completed seeding 150 acres of alfalfa, using oats as a nurse crop. One hundred and twenty-five more acres will be seeded in the next two weeks.

The planting of cantaloupes and setting out of sweet potato slips kept a large share of the interest of the irrigation farmers in Portales, New Mexico territory, during the early half of May. This, with their truck crops, in addition to alfalfa are keeping the farmers hard at it these days. This year will see more improvement along permanent lines in Portales valley than during any past years.

WASHINGTON.

The Spokane Orchard Homes Company has just finished setting out 15,000 fruit trees on its orchard west of Greenacres. In addition, the company is laying five miles of concrete water mains to convey water for irrigation, and a domestic water pipe will also be installed.

At a hearing of a petition of 57 land owners in Grant county, Washington, recently for the formation of the Quincy valley irrigation district, it was decided to name June 7th as the date of an election for the purpose of deciding whether or not such an irrigation district is to be formed. The district is composed of 500,000 acres of irrigable land near Ephrata. The promoters of the Quincy valley irrigation project hope by getting this district formed to be able to bond the district for \$100,000 which will enable necessary surveys and estimates to be made as to the cost of getting water on the land. The new project includes a vast acreage in Chelan, Douglas, Grant and Adams counties.

The heavy snow fall of last winter in the Cascade, Blue and Okanogan mountains means that the streams flowing from these mountains will be abundantly supplied with water this summer, and that irrigated districts of the state of Washington will not lack for moisture. At many places the snow fall was the heaviest for any winter in many years.

The federal government has successfully and satisfactorily completed one irrigation project in the state of Washington it developed at the hearing recently before Secretary Lane. When hearing on government work in the state of Washington was begun, Senator Jones said that the water users of the Okanogan project, though invited to send a representative to Washington, had not done so, as they had no complaints to register.

United States Reclamation Service is contemplating raising the Conconully Lake three feet above the high water mark, which will greatly increase the storage capacity.

Reports from Greenacres state that owing to the high water at Liberty Lake, it has been necessary to open the irrigation ditches to prevent the lake from overflowing. This will be good news to the farmers in that locality, as it denotes that there will be plenty of water for irrigation later in the season.

The first shipment of freight ever brought into Okanogan county by rail was brought in by the Reclamation Service recently, when four carloads of cement arrived at Riverside to be used in lining the canals of the government's irrigation project in that county.

The Hanford Irrigation & Power Company, in which former Judge C. H. Hanford, of Seattle, was heavily interested, and from whom the project took its name, has gone into the hands of a receiver. E. F. Benson has been named receiver to take charge of the company and carry out the obligations to the landholders, who have planted crops this year, depending upon getting their supply of water from the company's canals.

The North Coast Irrigation Company is preparing to put water on its lands southeast of Ritz-

ville. It is hoped to have the first unit, comprising about 1,000 acres, watered this season.

Senator Jones recently introduced a bill appropriating \$1,800,000 for constructing storage reservoirs to impound flood waters of the Yakima river. This will provide for the irrigation of 120,000 acres of land in the Yakima Indian reservation. The bill provides for free water for 64,000 acres of land now owned in fee by Indians. Twenty-eight thousand acres under Indian ownership are to bear proportionate acreage cost for providing this storage, while claims for water of owners of the remaining 18,000 acres, Indian title to which has been extinguished, shall be adjusted by the Secretary of the Interior. Eight per cent of allotted and patented lands will have to be pledged by owners, however, before an enlargement of the Wapato project will be undertaken.

CALIFORNIA.

John Dupee and Walter H. Dupee, of Chicago, have purchased the H. D. Williamson dairy ranch of 446 acres adjoining the town of Santee on the north for a reported consideration of \$100,000. The property has for some years been considered one of the finest appearing farms in the El Cajon valley and as one of the best producers of the back country. The San Diego River passes through the property and there is a complete pumping and irrigation system on the ranch. There is also a residence, large barns and outbuildings.

A large amount of material consisting of water pipe, farm and road-making implements, roofing, etc., was received from Los Angeles recently for the use of the Gibraltar Company. There is a larger number of men employed this week than ever, some putting it as high as 150. It is certain that a large amount of work has been accomplished already this season by this company. According to a recent statement over 60,000 feet of cement mains and laterals have been installed for irrigating purposes and over 4,000 feet of steel pipe of the domestic system laid. About 13,250 trees are planted in the orchards, over 5,200 eucalyptus and many palm trees line some of the roads and 22 buildings are either completed, being built, or have been ordered by the owners of land, who will make this their permanent residence when erected.

The installation of a clock meter at the Kings River weir of the Fresno Canal and Irrigation Company will be one of the early steps taken by the Fresno Irrigation Farms Company to compel the canal company to deliver to the farms company tract its due proportion of water.

The Patterson Irrigator says that the work of putting the rich lands of the great West Side under irrigation is going on apace, and it is certain that before long many more important projects will be started. The people in and around Tracy are very much interested in the problem of getting water to the grain lands, and recently a committee was ap-

pointed to secure information about forming an irrigation district in that section.

The Planada Development Corporation, it is stated, has the Holt tract plant ready to connect up with the irrigation system and expects to have water flowing at once. The new well on the Hayden tract is completed. It is a twelve-inch well, 261 feet deep with water rising to within 26 feet of the surface. The pipe is laid for the Hayden system and much of the ground prepared ready for alfalfa.

J. F. Lambert, superintendent for the Planada Development Corporation at Planada, spent two days in Los Angeles recently on business connected with the corporation's many improvements now under full sway at Planada.

A large number of water consumers have filed a complaint with the Railroad Commission against the Fresno Canal and Irrigation Company. The complaint comes from Laton, Cal., and is signed by a number of water consumers residing on the Laguna de Tache grant. They allege that the company has furnished inadequate service, an insufficient amount of water and has failed to properly distribute the water. The Commission is asked to decide upon some method of relief.

Judge Fulkerth has sustained the demurrer to the answer in the case of M. S. Sperry Land Company, which firm is suing the Supervisors of Stanislaus county and the Turlock Garden Land Company, alleging that no notice of the time in which the certain reclamation petition was to be heard by the board was given.

Several months ago the Turlock Garden Land Company petitioned the Supervisors for the privilege of forming a reclamation district in the county, the district to be formed being approximately 5,000 acres of the old Chatom ranch, lying along the San Joaquin River about ten miles south and west of Modesto. The Supervisors granted this petition and the Turlock Garden Land Company immediately began preparations for the undertaking of the work. Before any action could be taken, however, the M. S. Sperry Land Company, which company owns about 350 acres of land in the proposed reclamation district, brought suit against the Supervisors and the land company, alleging that the Supervisors acted without jurisdiction, and further that no published notice had been given of the time and place of hearing the petition for a reclamation district.

The case was argued before Judge Fulkerth some time ago, at which time the court advised all parties concerned that the board did go out of its jurisdiction in granting this petition. When the court sustained the demurrer as submitted by the plaintiffs, the action by the Supervisors became null and void.

The Turlock Garden Land Company will now be compelled to again submit a petition to the Board of Supervisors, at which time the attorneys for the Sperry Land Company will be present and set forth their arguments against the granting of the petition.

The decision is a most important one, as the forming of the proposed reclamation district is one

of the largest projects attempted in that country for some time past.

The bill of Senator Larkins to repeal the section of the irrigation district law which prevents the condemnation of mining rights or property by an irrigation district, which was defeated recently, was reconsidered recently on motion of Senator Kehoe. An agreement was reached with the Senators representing the mining counties, whereby the bill is to be amended so that it will protect from condemnation by irrigation districts water rights and ditches used for mining purposes, but will make it possible for districts to condemn property needed for reservoir sites.

Senator Larkins offered the amendment agreed upon, and it was adopted, and the bill will be reprinted and then come up again for passage.

MISCELLANEOUS.

Information from Ballinger, Texas, states that C. H. Alexander of the Colorado River Power Com-

pany, a company with \$12,000,000 capital, has made the Business League a proposition to build the big dam across the Colorado River near that place and put in the big irrigation project that was started there last fall. Mr. Alexander spent several days in Ballinger with his engineer going over the field and pronounced it one of the most favorable irrigation propositions in Texas. It is proposed to build a dam that will store water for irrigating about 75,000 acres of land, and the project will cost in the neighborhood of \$1,000,000. The local committee is pushing the proposition and the chairman of the committee says that actual work will begin at an early date.

The State Irrigation committee was in Sharon Springs, Kansas, last week and picked on a location southeast of town as a possible location for a demonstration well for deep irrigation. The county surveyor is surveying for the high point to sink a test well and when the well is drilled the well will be logged and a report made to the commission.

Here's a Machine That Actually Cuts Down Reclamation Costs



Various machines and methods have been employed on the reclamation and irrigation work that is being done in the Louisiana Marshes, Everglades of Florida, and other waste parts, but as yet nothing has equaled the time, money and labor-saving

BUCKEYE OPEN DITCHER

It is not an unusual thing for this machine to take the place of a gang of 100 to 150 hand laborers that had been stalled by the wretched condition of the ground and then do the work much better and many times faster than they could possibly have done it.

The Buckeye digs ditches as they should be dug—straight, clean, true to grade and with smooth, perfect sloping sides.

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Saves fifty per cent of fuel.

Most economical irrigating and drainage pump to both install and operate now on the market. Will work submerged if required.

Has given 16 years of satisfaction to the largest concerns in America.

STANDARD MACHINERY CO., Fisher Bldg., Chicago, Ill.

(Continued from page 242.)

each outlet for a distance of 14 feet on each side of it. The drop gutters may be drained in like manner or can be sloped slightly in one direction for their full length. For each in cleaning, round all angles and corners (except at the bottom of the drop gutters) by applying a 1 to 2 cement-sand mortar immediately after removing the forms.

CARING FOR CATTLE AND FLOOR.

Regardless of the kind of floor, bedding, or straw or litter is an absolute necessity: it keeps the cow clean and absorbs the valuable liquid manure. If the help can not be depended on to bed the cows properly, it is advisable to use a removable wooden grating, or platform. Cork bricks also give satisfactory results, but are somewhat expensive. They are set in a 2-inch depression in the floor and are held in position on all sides by the concrete acting as a curb.

With the proportions and thickness given above, 4 bags (1 barrel) of cement, 10 cubic feet of sand (say $\frac{3}{8}$ cubic yard) and 20 cubic feet of crushed rock (about $\frac{3}{4}$ cubic yard) will lay 45 to 50 square feet of floor. The usual cost of this much material alone is \$2.50. The floor soon pays for itself many times over.

RECLAMATION RECORD NOTES.

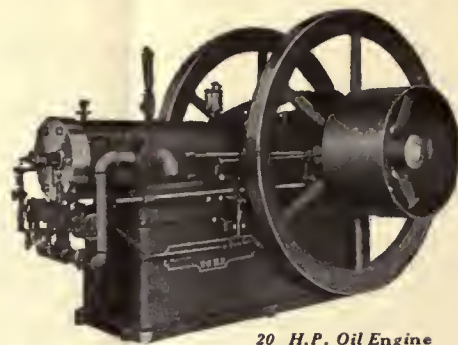
While the department does not require any specific amount of cultivation when the entry is made under the general homestead laws, there must be disclosed in all cases such actual cultivation of the entry as will show the good faith of the entryman.

A settlement lawfully initiated and occupancy, thereunder interrupted in obedience to an order of court is not thereby terminated or abandoned.

The preferential right of entry conferred upon homestead settlers by section 3 of the act of May 14, 1830 is, like the right created in favor of successful contestants by section 2 of said act, a personal privilege which cannot be transferred to another.

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Develop full-rated power on Kerosene, Gasoline or Distillate. Enable you to use the cheapest fuel available. Built for hard, continuous service; simple in construction and easy to operate; economical in use of fuel. Thoroughly reliable. Fully Guaranteed as to material, workmanship and power. Sizes 2 to 200 H.P. Our line of engines and pumps for irrigation and drainage is complete. Write for catalogue No DY650.



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Locate in this land of prize crops and cattle. The world's greatest prize for wheat, a \$5,000 tractor outfit, was won by farmers in Montana on our line. The farm of Ed. Conley, near McKenzie, N. D., produced crops last year which sold for more than he paid for the land. One man on 40 acres made a fine living for his family of eleven and put \$2,385 in the bank! Such instances are numerous. Investigate! Let us help you locate on land famous for wheat, oats, barley, flax, rye, fodder corn, alfalfa (3 crops a year), timothy. Or start a garden farm. Raise with great success and profits—potatoes, onions, peas, beans, all vegetables. Great ranches for horses, sheep hogs, etc. Dairying, poultry, bees—all thrive. Greatest apple orchards on earth—all fruits profitable. Whatever you want, the Northwest has it. We will gladly help you with information, free literature and LOW RATE EXCURSION TICKETS to look the country over. Mark and mail this Coupon today, or write to

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Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics, add \$2.50 to above price.

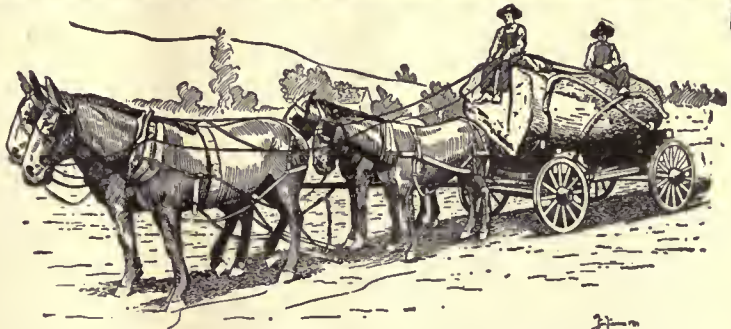
Finish This Story

A WORKMAN in an I H C wagon factory was explaining the various stages of wagon construction to an interested visitor. He picked up two pieces of long leaf yellow pine, which to all appearances were sawed from the same board, and asked the visitor to notice the difference in the weight of the two pieces. The lighter piece, he explained, was kiln-dried. The heavier piece was air-dried and more thoroughly seasoned. It had retained the resinous sap which adds strength and toughness, while in the kiln-dried piece of lumber this sap had been drawn out by the too rapid application of heat.

Every Stick of Lumber Used in I H C Wagons is Carefully Selected, Air-Dried Stock

Here was something to think about. The visitor asked for a test as to the relative strength of the two pieces of wood. The air-dried piece held up under nearly double the weight under which the kiln-dried piece of lumber broke. The workman explained how the comparative life of air-dried and kiln-dried lumber has about as great a difference.

To the eye there was no difference between these two pieces of lumber, but when put to



the test there was a vast difference. So it is throughout the construction of I H C wagons—Weber, Columbus, New Bettendorf, Steel King. They are built for real strength, light draft, and satisfactory service.

After seeing the care used in the construction of every part of an I H C wagon, the visitor asked: "Why don't you let people know of the great care used in selecting material and in constructing I H C wagons?"

This is what we have been trying to do, but we cannot tell it all in one short advertisement.

Weber and Columbus wagons have wood gears. Steel King and New Bettendorf have steel gears. I H C local dealers handle the wagons best suited to your work. See them for literature and full information, or, write the nearest branch house.

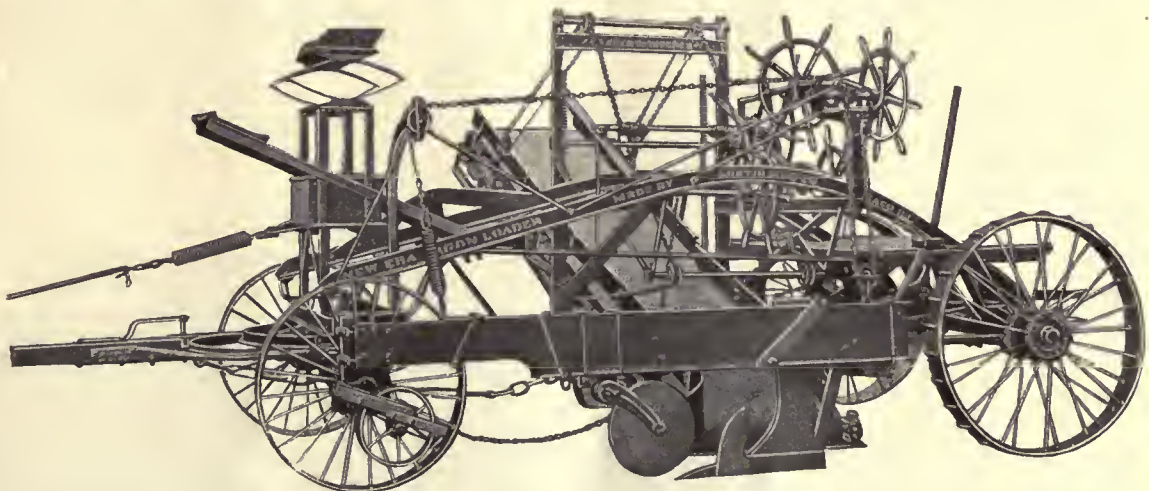
WESTERN BRANCH HOUSES: Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

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THE WINNER



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The Cement Tile Machinery Co.

175 Rath Street,

WATERLOO, IOWA

(Continued from page 245.)

cessfully grown for a number of years, such inoculation is probably a useless expense.

"There are two general ways of inoculating the soil. The best is by spreading soil from an old, well-established and vigorous alfalfa field, or from a sweet clover patch. If a few hundred pounds of this soil is scattered on land which has been properly prepared and manured, and if the soil has not been exposed to the sun or allowed to dry out, good results will usually follow. The other method is by the use of cultures. There are now a number of reliable companies manufacturing the culture. It comes in bottles and is used on the seed. The ordinary cost of a sufficient amount to treat the seed for one acre is about \$2.00. The United States Government also furnishes the culture in limited quantities. Complete directions always accompany the culture. Soil inoculation is more certain and not as expensive as the cultures where there is an old and vigorous alfalfa field near.

"If alfalfa has never been grown in the community, or on the farm, or if it is not successful, it is usually advisable to inoculate. Wherever alfalfa is showing, during the first year, a weak, yellowish growth either in spots or over the entire field, it may be of advantage to inoculate the soil. This can be done by applying to the new seeding soil from an old field, or by treating some soil mixed with well-rotten manure with the culture and applying this with a manure spreader. Where the speed of the spreader cannot be sufficiently reduced, the mixture may be scattered with a fork or shovel and the field harrowed."

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THE KING'S ROYAL HOTEL AND PARK COMPANY

OWEN SOUND, CANADA

WILLIAM GALL, Manager

ALEX. H. S. RITCHIE, Assistant Manager

(Continued from page 246.)

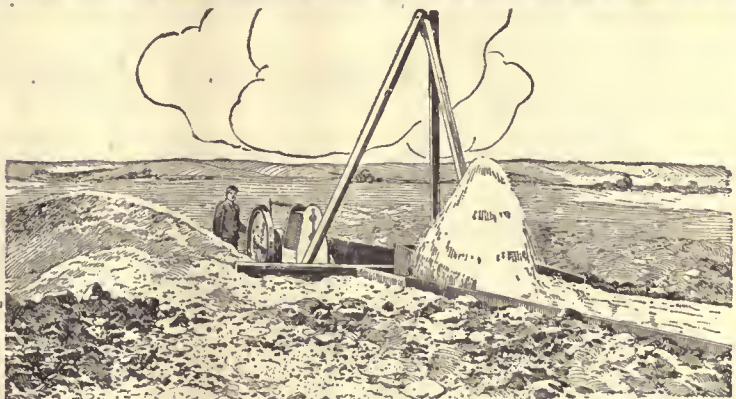
about July, and citrus trees about September; the former cost about \$12 to \$15 and the latter \$35 to \$45 per 100. Of course, all such take some years to mature, so that in the meanwhile dairying is a sure standby until they do. It is confidently expected that fruit growing will in time be a prominent undertaking here.

The instances of good crops, marvelous yields and high prices are many here, but the writer does not believe in quoting these now, as prospective settlers would possibly consider such to be the general rule, and depend upon such always coming to pass, but it is quite safe to state that taking things all round, they compare here most favorably with those of any other part of the world where such an undertaking is in progress. At present the irrigation scheme here is only in its infancy as yet. It would therefore be quite impossible to prophesy as to future results, but if it continues to progress in the future as it has done since its inception, one prophecy alone, and that made by your Mr. Mead, is certain to come to pass, and that was that the land bought from the Government at from \$40 to \$75 per acre will, in a few years' time be worth \$500. Therefore, if that was the only thing in its favor, it should in itself place the state of Victoria in the front rank of irrigation countries; but there are many others as well who have the soil which will grow almost anything—the water and the climate and a given assurance to all prospective settlers of a hearty welcome and all reasonable assistance to ensure

(Continued on page 260.)

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INDEPENDENT irrigating systems, when properly operated, prove true to their title—they make you independent of rain or other uncertain sources of supply. Almost without exception they prove the cheapest and most satisfactory. If you are able to secure a sufficient supply of water by sinking wells, or from a lake or stream, you should start today to lay out a good irrigating system. Dependable power is easy to obtain. An



I H C Oil and Gas Engine

will take care of the pumping and will also furnish power to run any farm machine. It will require no watching except to keep it properly oiled. It is the cheapest and most dependable power you can secure.

I H C engines are built in many styles—vertical, horizontal, portable, skidded, air-cooled, water-cooled; in sizes from 1 to 50-horse power. They operate on gas, gasoline, naphtha, kerosene, distillate, alcohol.

I H C tractors are built in sizes from 12 to 60-horse power. There are also spraying, pumping, hay baling, wood-sawing, outfits, etc.



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The field is unlimited and uncrowded; marketing the product in competition with the clay interests and at clay tile prices produces a great profit and a glance at the future spells only success for the factory or business started today.

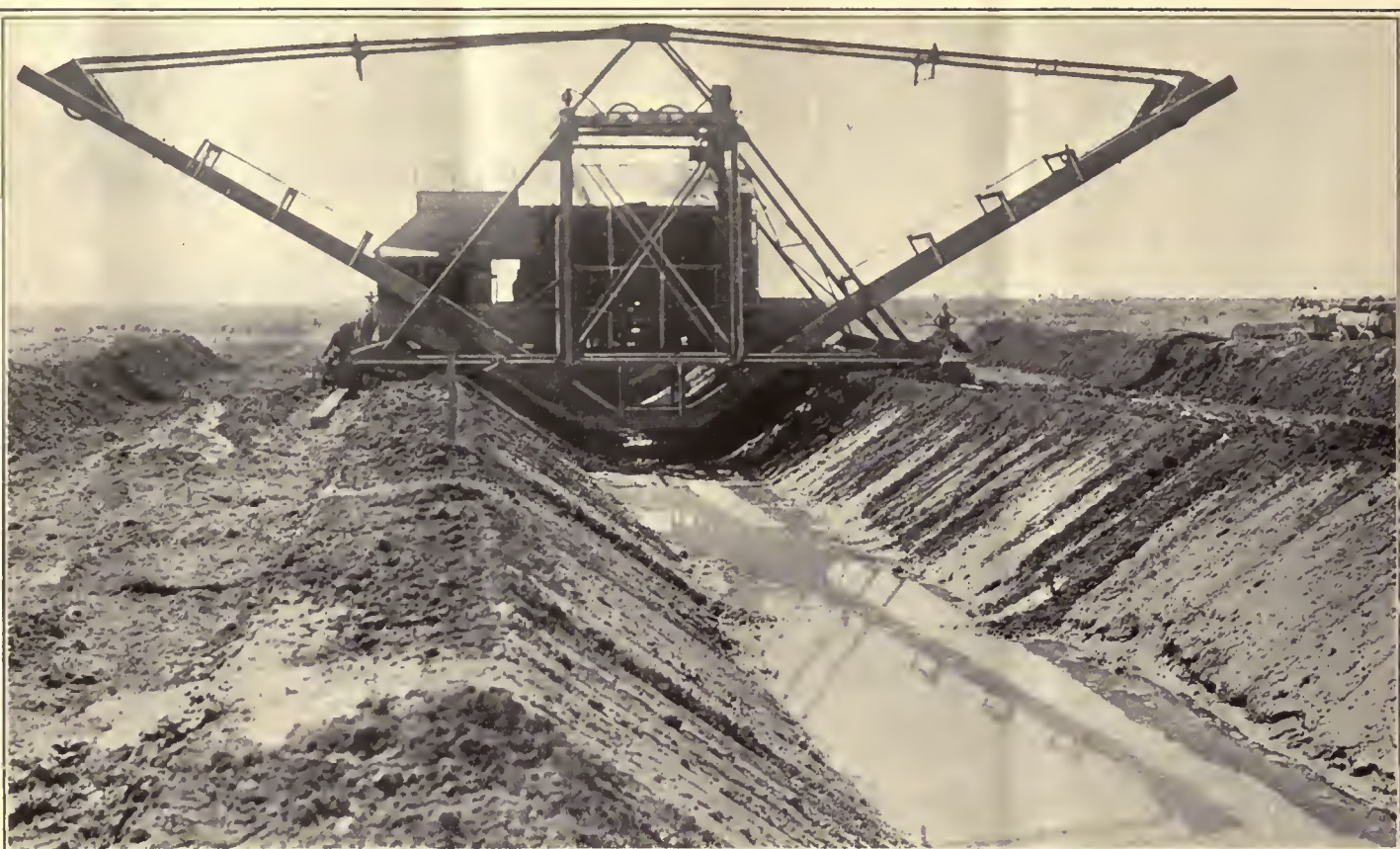
No existing proposition offers such flattering inducements or such a field of opportunity for the man looking for a vocation or, for the man looking for an investment. No other business can net you such profits on the amount of capital involved, and no other business has such an unlimited future.

Just think of a business paying from 30% to 50% on the investment the very first season, and subsequently from 50% to 150%, then ask yourself the question—Is it worthy of investigation?

Our literature gives you all the details regarding the merits of cement tile, the cost of manufacture, the amount of capital required to embark in the business; how to build your factory and last, but not least, it tells you how we aid the manufacturer using our machinery and gives you our full and complete proposition. A short letter telling that you are interested will bring complete data.

The Cement Tile Machinery CO.

172 Rath St., Waterloo, Iowa.



Trimming for Lining Irrigation Ditches Costs $1\frac{1}{2}$ Cents per Square Foot

Government Reports give the cost of trimming irrigation ditches as an average of $1\frac{1}{2}$ cents per square foot of slope and bottom area and the cost of concrete lining 3 in. thick as an average of 15 cents per square foot including trimming.

**Ten per Cent of the Cost of Lining Irrigation Ditches is
Eliminated by Ditching with an Austin Drainage Excavator**

Because it carves the ditch to templet without disturbing the natural soil beyond the channel limits, no trimming, shaping or cleaning is necessary to fit the earth cut for its concrete or other lining.

Thirty thousand Cubic Yards of Earth Moved in One Month

Is the record of the Austin Drainage Excavator in hard digging and every yard dug was ditch produced because there is no waste excavation when

————— Ditches are Dug to Templet —————

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F. C. Austin Drainage Excavator Company

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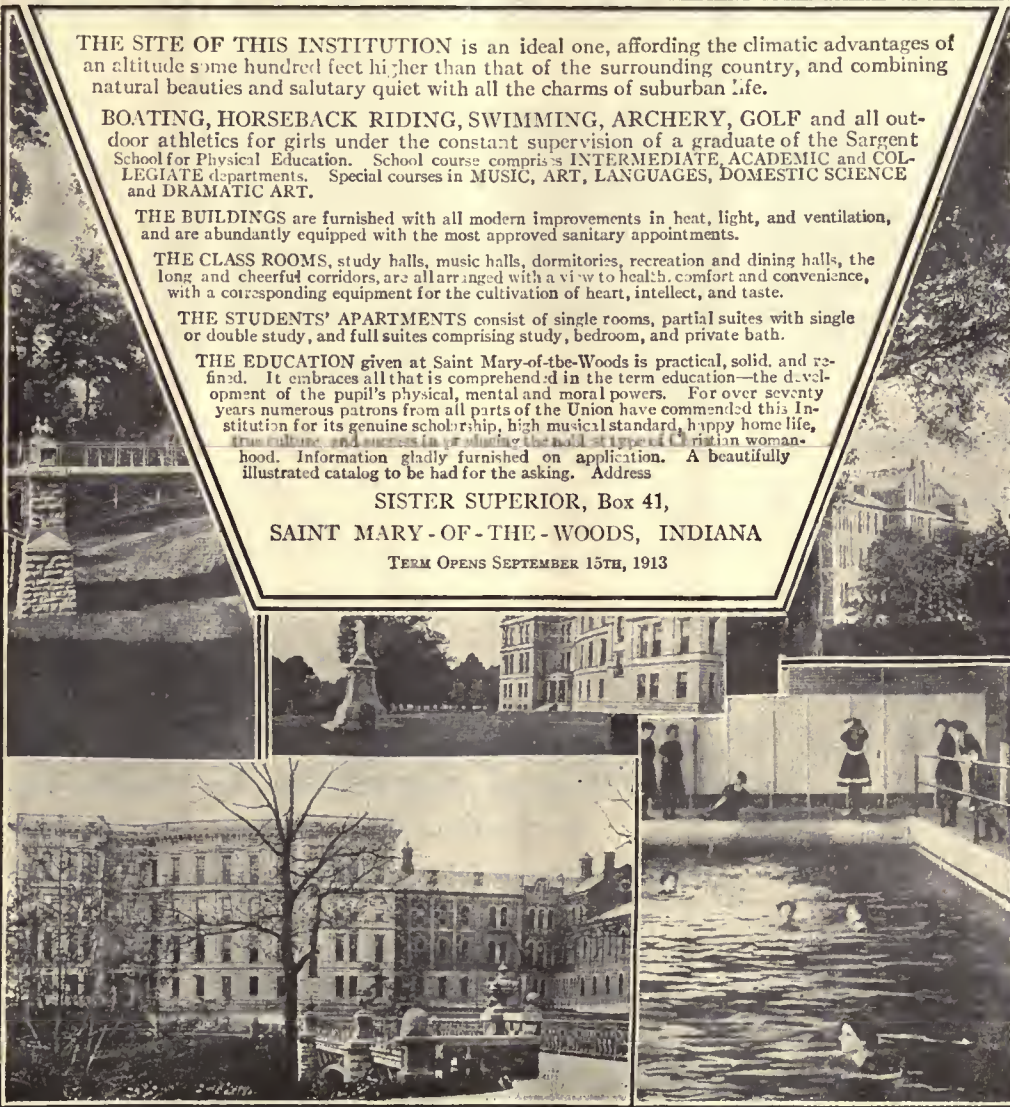
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SAINT MARY - OF - THE - WOODS, INDIANA

TERM OPENS SEPTEMBER 15TH, 1913



(Continued from page 257.)

success. Therefore it should not be very long before members of our race come to try their luck in sunny Victoria.

In conclusion the writer hopes in his next and final article to explain exactly how a settler with care and resourcefulness may find himself on the road to success, with a start of but half the capital enumerated in article No 1, or in other words, to state his own case exactly as it occurred, for it is possible many stout hearts lie behind small capital, who, if they only thought it wise to try their luck, having the knowledge of one who did, they also would do so without delay, and quite possibly make a better claim in more ways than one to success than the writer.

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Made of specially selected upper leather and well seasoned soles. Durable, tough, pliable. Treated by special process to keep out water and moisture. For dress-up occasion wear Mayer's Honorbilt fine shoes.

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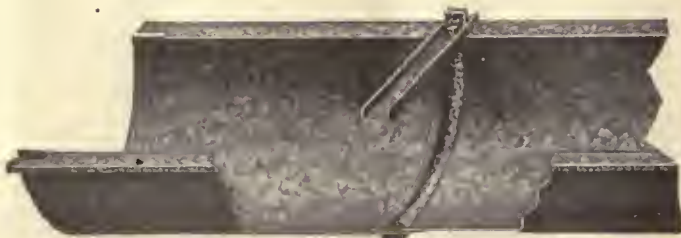
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KLAUER MFG. COMPANY, Dubuque, Iowa

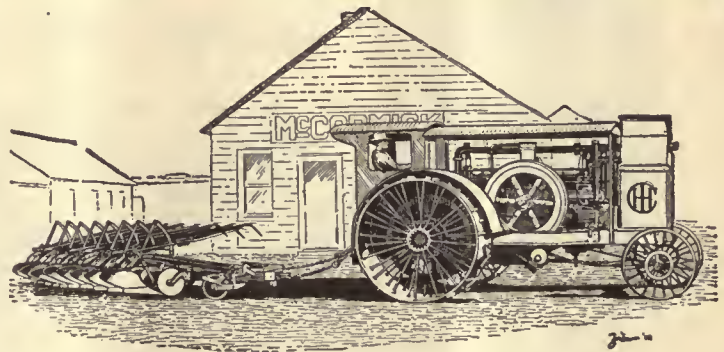
Make Your Work Count

WHEN you start your spring work this season — plowing, harrowing, rolling, seeding, etc., — you can make your work easier, do it faster and better, and save money besides by putting an I H C tractor on the job. If your farm is small, buy a small tractor, 12, 15, 20, or perhaps 25-horse power; if large you can use a 25, 30, 45, or 60-horse power machine to advantage. An I H C tractor makes your work count. With it you can plow from two to ten times as much ground in the same time as with a horse plow. You can plow, harrow and roll at the same operation; you can draw two to four drills; at harvest time you can use it to draw the binders. It saves time and money in every operation. Make your work count.

Buy An I H C Oil Tractor

Besides doing the other work at a saving, you can use it also for threshing, grinding, road making, irrigating, or any other belt power and draw bar work to which it is adapted. When used for all the work that it will do, the I H C tractor is one of the handiest machines, also one of the most economical, that you can have on your farm.

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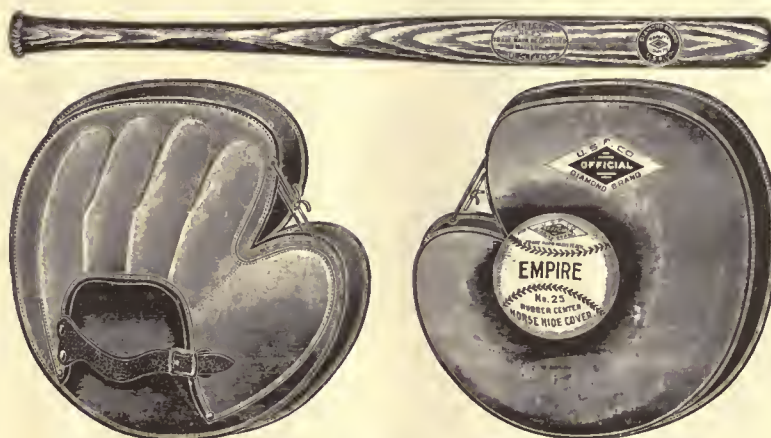


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C. L. FITCH.

Colorado Agricultural Experiment Station, Fort Collins, Colo.

Experience has proven that the drylander should plant both early and late varieties of potatoes, to catch the season at one end or the other. Early Ohios have been most planted for early, but above the ditch are apt to be rusty fleshed, from soil heat in a dry summer. Irish Cobblers are better in this respect, and yield more in a good year. Pearls mostly are planted for late.

It is a good plan on dry land to mark the field both ways and to plant the potatoes at the cross mark, and cultivate them both ways, so as to reduce hand work. It is risky to plant on ground in a dry year with a dried out subsoil, but with a good spring and a subsoil in good condition, wide spacing makes potatoes fairly sure, where leaf roll has not appeared.

There are many excellent dry-land regions for potato growing in the western half of Colorado, and table lands of the N. E. have produced good crops. New settlers in the plains in the southern part of the states should be cautious, as potatoes have been a complete failure in most places in that region.

Dry lands, notably the Arkansas divide, have suffered severely from potato leaf roll, and new settlers should make careful inquiry regarding their neighbors' experience in 1911 and 1912 before giving much land or work to potatoes.

Nearly every newcomer seems to have to learn for himself that we have conditions and localities where it is cheaper to purchase potatoes at the store than to try to raise them.

NOTICE OF PUBLIC HEARING ON THE GIPSY MOTH AND BROWN-TAIL MOTH

The Secretary of Agriculture deems it necessary, in order to prevent the distribution of the gipsy moth and the brown-tail moth into sections of the United States outside of the New England states, to extend the present quarantine lines in New England beyond those indicated in Notice of Quarantine No. 4, to cover the extension, during the year, of the known range of these two insects.


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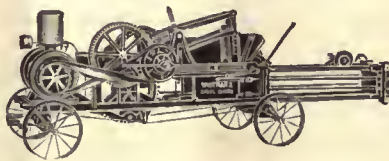
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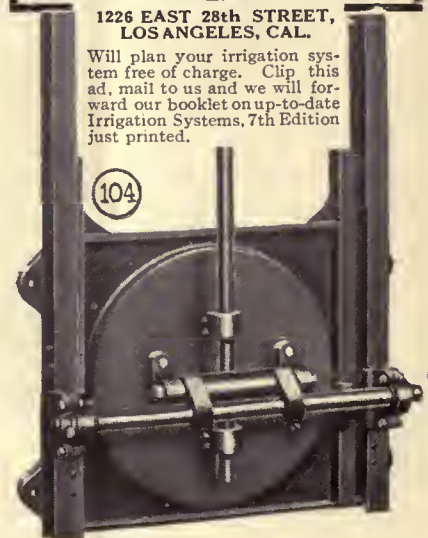
We are the originators of the scientific irrigation system. Our Gates and Valves are the product of many years' investigation, study and improvement—the best in the world.

Install our economical irrigation system as others are doing—and do it before you lose in the race for dollars through wasteful methods and keen competition. The

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Will plan your irrigation system free of charge. Clip this ad, mail to us and we will forward our booklet on up-to-date Irrigation Systems, 7th Edition just printed.



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From this time on, when you buy a car, these are things to watch for.

Left-side drive—

Center control—

Oversize tires—

Set-in dash lights—

Free entrance in front—

Right-side drive has been abandoned by the leading cars. Hereafter drivers will sit close to the cars they pass.

Skippy tires are out-of-date. So are projecting side lamps. So is a blocked front door. These features are absent in the best cars now. They'll be absent in all cars soon.

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Note that Reo the Fifth has all these new features. And our center control is a one-rod control—an exclusive Reo Feature.

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Then the Reo marks the latest practice in some other general respects:

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Vast overcapacity—

15 roller bearings—

190 drop forgings—

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Roller bearings cost five times what common bearings cost, but they do not break. Drop forgings cost twice as much as steel castings, but they don't have flaws.

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Reo the Fifth marks the best I know after 26 years of car building, I would not buy a lesser car myself, so I shall never build one.

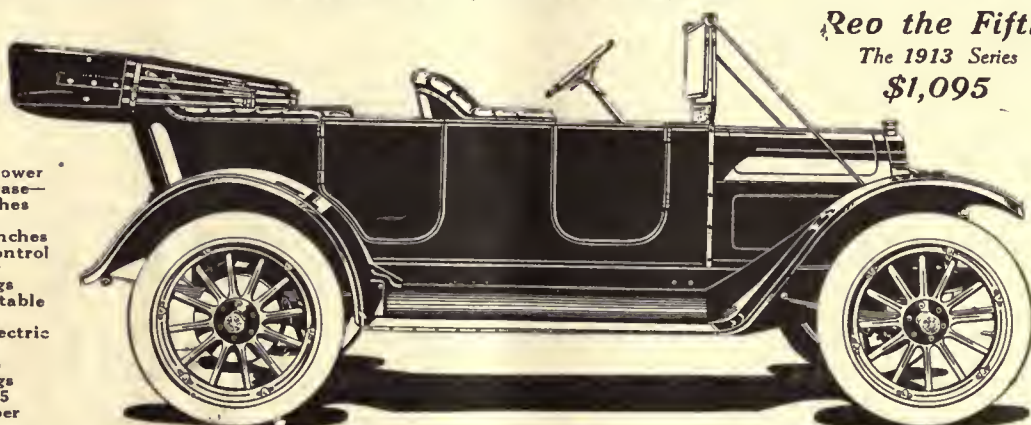
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Reo the Fifth
The 1913 Series
\$1,095

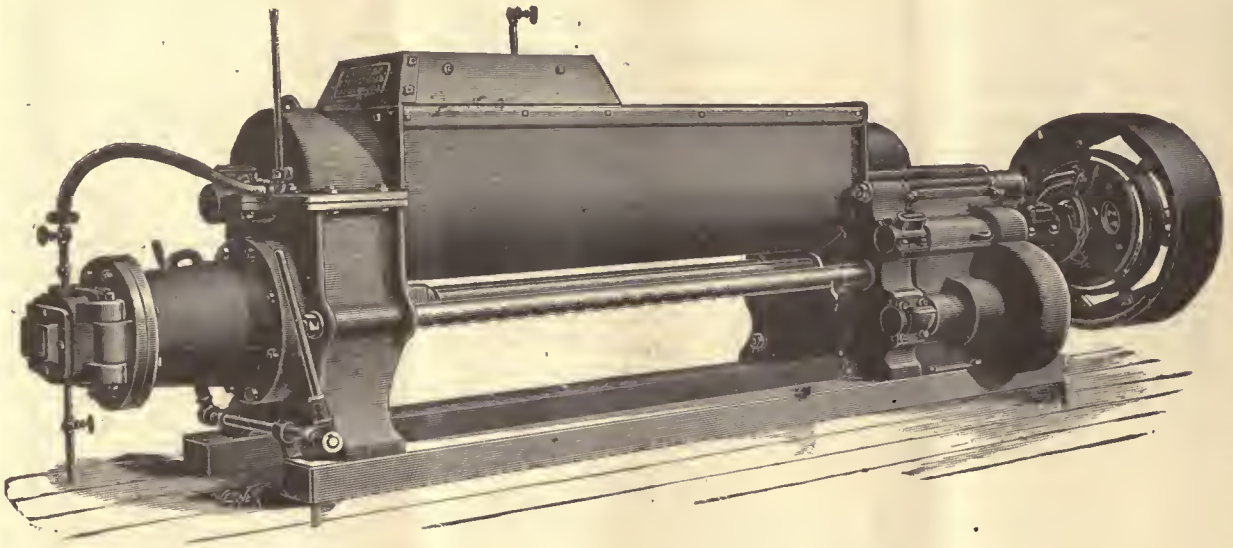
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112 Inches
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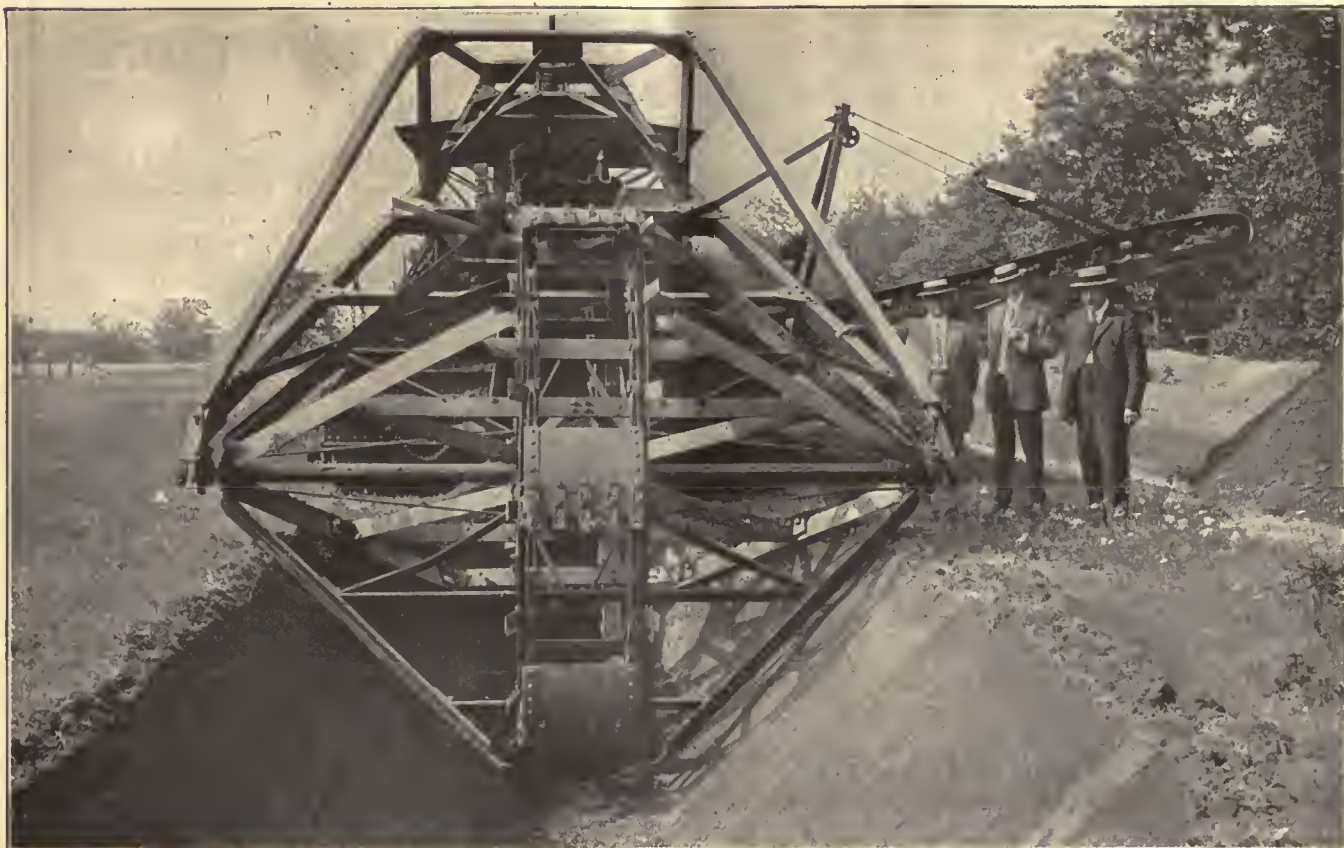
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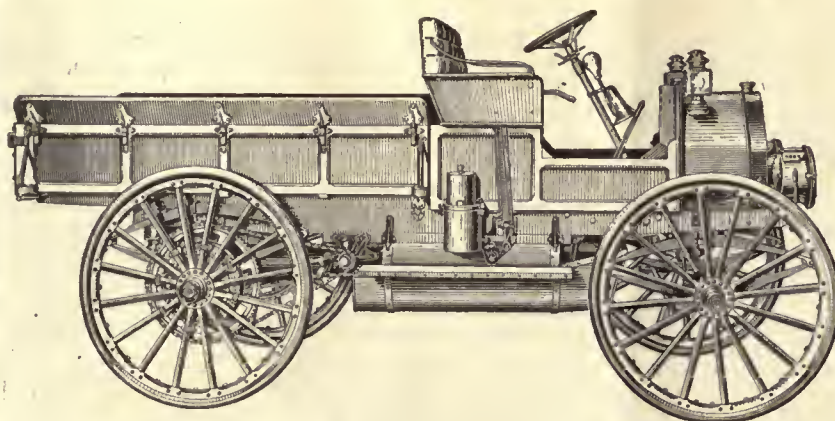
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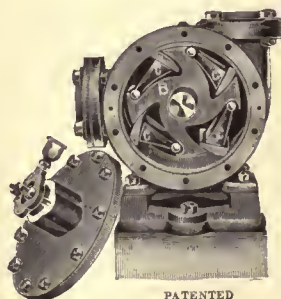
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THE IRRIGATION AGE

VOL. XXVIII

CHICAGO, JULY, 1913.

No. 9

THE IRRIGATION AGE

With which is Merged

The National Land and Irrigation Journal

MODERN IRRIGATION

THE IRRIGATION ERA

ARID AMERICA

THE DRAINAGE JOURNAL

MID-WEST

THE FARM HERALD

THE IRRIGATOR

D. H. ANDERSON

PUBLISHER,

30 No. Dearborn Street,

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CHICAGO

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It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 28 years old and is the pioneer publication of its class in the world.

The Arrogance of Ignorance

We note in recent dispatches that Gifford Pinchot, at one time director of the Forestry Division of the U. S. Department of Agriculture, is heading a move to carry out an extensive plan of stream control, water measurement, flood prevention, forestry supervision and numerous other ideas on the line of conservation of our natural resources. Whether Mr. Pinchot has absorbed some of George H. Maxwell's ideas or whether the thought which developed this movement originated in his own brain, or was elsewhere borrowed, is a matter of no particular importance. Mr. Pinchot is like a great many other products of the Rooseveltian Era in having taken on from his superior a longing for notoriety and self-aggrandizement.

Mr. Pinchot, in his early connection with forestry affairs, gave promise of becoming a man of importance in this line in the country, had it not been for the fact that his contact with President Roosevelt, and a few others who were high in officialdom under that administration, evidently had the effect on Mr. Pinchot similar to that produced on a new graduate from high school or college when handed his diploma. Mr. Pinchot was lionized by many well intentioned people throughout

the western country. No doubt the attention he received at public gatherings and elsewhere had something to do with swelling his head and bringing about his arrogant attitude toward honest criticism of his work.

There was a period during the Roosevelt administration when Mr. Pinchot practically dominated the land and forestry affairs of the western country. His statements were accepted without question by the president. The principal information secured by Colonel Roosevelt concerning the Los Angeles-Owens Valley affair was secured direct from Mr. Pinchot or his representatives in that country.

The public will not be as keen to accept Pinchot's suggestions of flood control as it would have been earlier in his career. The recent exposure of the manipulation of the Forestry Bureau will have something to do with further discrediting Mr. Pinchot and his leading supporters.

The Honorable William E. Humphrey, of the State of Washington, in his speech delivered June 2, 1913, before the House of Representatives, on national forests—many of which were created during the Roosevelt regime—says: "I want to make the statement in the beginning that I was one man

from the far West that favored the creation of the forest reserves. It is with sincere regret that I have been forced to the conclusion that their creation and administration have been the greatest public wrong ever permitted in the history of this country. Like most people, I was ignorant enough to suppose that a forest reserve would have timber upon it. One-third of the entire area of the one hundred and sixty reserves has no forest upon it—never had and never will have.”

The arguments used by Mr. Pinchot and his friends in the forest reserve propaganda were charmingly ingenious. In our editorial columns of February, 1904, *THE IRRIGATION AGE* published a story of Mr. Pinchot and the manipulation of his press bureau through which he created public sentiment in favor of forest reserves. As one looks back over the field and studies the conduct of that coterie of “high lights” many errors of judgment may be detected in Mr. Pinchot’s attitude, and we are forced to classify his subsequent position before the public as the arrogance of ignorance.

It seems almost a waste of space to discuss a man who is out of the running as is Mr. Pinchot, but one is compelled to pay some attention to each new movement on the part of himself and friends. Those who are familiar with his history are inclined to associate all new moves made by him with the useful and overworked—(?).

Growing Seed for the Professional Seedsmen

Professional seedsmen in various parts of the country, and especially those who have a just business pride in the high class of their products, are now largely having their seeds grown for them on irrigated lands. The reason for this is that the seed thus raised is plumper, more fertile, and gives better results than that grown by the seedsmen themselves, or obtained by them from the unirrigated sections.

Among the large houses which are following this practice are D. M. Ferry & Co., of Detroit, Mich.; August Voegler, Salt Lake City; the Allan Seed Company, of Sheboygan, Wis., and the Alfred J. Brown Company, of Grand Rapids, Mich. These concerns have made extensive contracts for clover seed of all kinds, and garden peas and beans. There is a marked advantage to the grower in the fact that a market is assured for his crop at a good price before it is grown, and he is under no expense for seed, this being furnished by the contracting seedsmen.

Thus far the seed-growing contracts have been largely confined to peas, beans, and clover, but it is practically a certainty that the practice will soon

be extended to include all kinds of vegetables and fruits as the transplanting, or raising of a second crop on irrigated land undoubtedly improves its quality and germinating power.

List Growing In Argentine Republic

The receipt of seven subscriptions during the month of June from farmers and ranchmen around Colonia Alvear, Argentine Republic, indicates that there is a growing interest in that country in the subject of irrigation. This should be of more than ordinary interest to our readers who are advertisers as it opens up a field for the distribution of American-made machinery of all kinds in that country. While seven new subscriptions from any state or specified area is not an unusual addition to our list, the fact that that number of readers has been obtained in this particular section of the Argentine Republic indicates a desire for information along healthy lines. It offers a suggestion as to the possibilities of a general campaign of the arid sections of South America to build our subscription list. We hope to be able to carry out this work at no distant date, and will then be in a position to offer several thousands of readers of this character to our advertising patrons. Our subscription department is at present working on a subscription campaign in Australia in which we are being ably assisted by some of the officials of the various states of that country. Judging from the results obtained so far we should have several thousand readers in the arid states of Australia by the beginning of the year 1914. Some of our advertisers have received very good results in that country, one advertiser in particular has sold over \$200,000 worth of machinery to the government of one state in Australia alone as a result of an advertisement carried in the columns of *THE IRRIGATION AGE*. Placing the profits of a sale of this character as low as 10 per cent, which is, no doubt, much lower than the actual profit obtained in selling goods to foreign countries, it may be seen that the manufacturer has done fairly well through his investment in advertising space in these columns. These facts are presented with a view to enlighten our advertising readers on the possibilities of developing trade among the readers of *THE IRRIGATION AGE*. *THE AGE* is, today, the only publication of its class in the world. The present owner has purchased during the past ten years all other journals in this line, the circulation of each having been merged with that of *THE AGE*. We are, therefore, in a position to offer manufacturers and advertisers a distinct and profitable field for the marketing of their wares.

California's Fight Against Japanese A recent issue of one of our Idaho exchanges contains an editorial on the Japanese question which, to our mind, shows a woeful lack of information concerning the true situation in California. The writer says that the spectacle of a state—one of the many in the union—endangering the peace of the whole by its self-inflicted fright over the “yellow peril” has reached the stage of the ridiculous. It is pure selfishness, declares the editorial further, that is prompting the trouble. The people of California made no objection when they needed it to the cheap labor at her command from the little brown man “living on a handful of rice per day.” Many of the great undertakings of the State of California, it alleges, have been accomplished with this labor. THE IRRIGATION AGE suggests that our Idaho friend should spend some time in California, and study the local situation there. The writer has in mind one case which fairly well illustrates what the people of California have to contend with in their contact with the Japanese race. It has always been a source of wonder why, when so much criticism of the people of California and its governing bodies was being indulged in, the people did not take advantage of the opportunity for publicity which any of the eastern papers would gladly offer, so that they could present their side of the story. The legislature of California would have been justified in adopting the plan carried out by foreign governments of purchasing reading matter space in the leading eastern journals to exploit their position and in that way shape sentiment in their favor. The particular case which occurs to the writer at this time is that of the truck gardeners and fruit growers near Galt, California. Some years ago all of the work of handling the truck farms and the fruit ranches was done by white labor. One day, however, the “king bee” of a Japanese labor organization called on several farmers in that vicinity and offered to take over this character of work at about one-half of the price which was being paid to the white laborers. The ranchmen very foolishly accepted his proposition. The result was that within a year or two all of the white laborers had left that section and the work was being performed entirely by Japanese. At the beginning of the third season of this arrangement, the majordomo of the Japanese notified the ranchmen that the price of labor would be increased 25 per cent and in the absence of any other class of available labor, they were compelled to stand the raise. Subsequently, another raise was insisted upon, which brought the price higher than what was being paid the white men before the change was made. The ranchmen were helpless,

owing to the fact that there was no other available help to be secured. To cap the climax, the following year when the crops and fruit were ready to be harvested the Japanese made a demand on the ranchmen for the sale to them of their property, and the offer being refused, all of them quit and left the ranchmen with their crops unharvested and fruit unpicked. Some of the weak ones among the ranchmen were inclined to sell, but the publicity given the affair was an aid in securing outside labor; and the people of that section of California will not be likely to let Japanese labor secure an upper hand the second time.

The object in presenting this situation at this time is to illustrate why the citizens of California are justified in their attitude toward Japanese labor. Never in the history of white labor in this country has any similar offer been put up to a lot of land owners by white labor, and it would be well for all of those in the East who are not familiar with the situation in California to study it before forming an adverse opinion on the stand taken by the citizens of California. The people of California are more likely to understand their position and needs than an outsider who is not familiar with conditions.

Golden Future for the Wise Farmer

The time is at hand for the man who desires to make something more than a mere living at farming to act. The time is fully ripe; it is propitious. Under the best of conditions our agricultural population is continually falling behind in its efforts to supply the markets of the world. Daily our available stocks of food supplies become smaller, and prices mount higher. Improved methods of farming, the ability to make two blades of grass grow where one grew before, will help some, but not enough. It will merely mean a betterment, in a small way, of the individual who farms on a scientific system, but the world at large must look elsewhere for relief from the existing conditions.

Adequate relief can come only in one way. We must cultivate, and cultivate intelligently, more land—millions of acres more land. But how? Virtually all the area in this country susceptible to cultivation by ordinary methods is now under the plow.

Fortunately there is an empire as yet barely touched. In many sections of the West, the Northwest and Southwest, are countless acres of highly productive land, provided water is brought to it. But a small part of this enormous area has as yet been cultivated because the necessary moisture is lacking. Wherever irrigation plants have been constructed and honestly administered, and the soil

has been carefully and intelligently cultivated, the financial returns have been astonishingly large. The incomes from irrigated farms read like fairy tales to the men who are grubbing away on the old plan.

Not only are the yields from irrigated lands phenomenally large, but the quality is so good that the products invariably command a premium. When to this is added the further fact that there are no crop failures, we have an ideal condition. No droughts to burn up the crops, no excessive rains to drown them out or delay seed time or harvest. The wise man is he who settles on a 40 or 80-acre tract and cultivates it intensively. It will make him rich.

A Bankrupt Irrigation Concern

During the past month there was sold under the hammer of the referee in bankruptcy at Vale, Oregon, the assets and property of the Willow River Land and Irrigation Company. Information which comes through the press indicates that the property value is much below the liabilities, and that heavy expenditures will have to be made to bring the project to a point where anything can be realized by those who made the original investment. Report is current that the people who have taken over the property intend to place the entire acreage in orchard lands with the hope of ultimately selling it at the price of \$1,000 per acre. This, it strikes us, is an extremely visionary view, and they who are working out the plan will find it difficult to accomplish. One of our western exchanges in discussing the subject has the following to say that is timely concerning the general situation.

It may be well to state here that THE IRRIGATION AGE has avoided criticisms of this character for fear that injury would be done to legitimate concerns that are struggling to make good. The following is from the *Carey Act Farmer*:

In the meantime it may be well to inquire as to what representations they will make to the prospective buyer as an inducement to invest in the property after it is in the orchard.

It is presumed that they will use every means, legitimate or otherwise, to get their money out of the project. We have failed to note any construction company that have put their money into these projects for the fun of the investment.

Failures of this kind, and the Lost River affair is what makes irrigation securities a drug on the market, and should wake up the states to a closer scrutiny of proposed schemes of reclamation. With the proper supervision and inspection such conditions would be impossible, and every fly-by-night company would not be permitted to speculate with the last dollar of the settler they succeed in coaxing onto their projects.

Citizens of Idaho returning from the east bring the gossip of the papers and the people of those states that have sent thousands of people and millions of dollars for the development of the arid West. They are anything but flattering. They indicate extreme distrust in any and all western investments. They impress one with the idea of a great commonwealth standing by and permitting the false pretenses to be traded for the life savings of the man on the land. State officials sit in their easy chairs and "pass" on applications of companies to segregate and water land without knowing whether or not the project is feasible. Or whether there is protection for the man who will invest all he has in the land.

When the state permits a company to get settlers on arid land they should be sure that there is available water, and should compel its delivery as per the contract. Failing to do this the state stands convicted of being an accomplice to the fraud, and does not deserve prosperity.

There should be provision in the law that, in case the company did not succeed in its undertaking, all money paid to them by the settler should be returned, with interest and the expense of coming onto the land, and this provision should be enforced and the settler protected by a good and sufficient bond for that purpose.

If there is to be a loss it should fall upon those who have initiated the project for the purpose of making money out of it, and not upon the settler.

If the bonds are sold to "widows, orphans, etc.," as is usually claimed, then there is double argument for state protection and supervision.

From any angle there appears to be some vital flaw in the whole system, and after all the years of experiment the state does not seem to be nearer a solution than before.

Bankruptcies, receivers and total losses seem to follow in the wake of the irrigation promoter. It is up to the state.

Too Much Water in Irrigation an Evil

One of the most serious things the honest manager of an irrigation plant has to contend with is the tendency of the beginner to use too much water. In many cases it takes two or three years of bitter experience to convince the greenhorn that too much water is fully as bad as not having enough. Efforts of the managers to instruct him on this subject at the start are usually of no avail. Advice to "go slow" is looked upon with suspicion and set down to a desire on the manager's part to save water for the company so a larger area may be served.

"Smart cuss, that manager. Thinks he's going to bunco me out of the water I'm entitled to so's he can sell it to someone else. But he can't fool me. I'm going to have all I want."

This is the average argument with which advice to go slow with the water is met. The beginner, before he learns better, gets all he wants, and more. So long as it doesn't stand in puddles

on his land he lets it run. He is deceived by the porousness of the soil and allows it to soak up an incredible quantity. This is too bad, as it invariably means total or partial crop failure, and the beginner, who does not not understand the reason, is disgusted.

Nearly all arid lands contain a large proportion of alkali. So long as this remains incorporated with the soil, distributed as nature had placed it, no harm is done. But, in the process of evaporation, the excess moisture draws the alkali to the surface of the ground. Then there is trouble. This chemical constituent is not friendly to growing crops. Its presence in any considerable quantity on the surface of the ground means disaster.

This was what the honest manager of the irrigation plant tried to warn the beginner against, but his friendly efforts were misunderstood and misconstrued. Even where there is an abundance of water it is unwise, it is detrimental to successful farming, to deluge the land simply because a limitless quantity is at hand. It means the undoing, the defeat, of the man who practices it. Plant life calls for just so much moisture; any excess is injurious. In cases where the water supply is limited the practice of letting it run unrestricted is also criminal. It not only injures the man who indulges in it, but it assumes the phase of larceny from his neighbors.

Improving the Value of Irrigation Securities

Governor Haines of Idaho has shown good sense in his selection of a committee to investigate and report on irrigation securities with a view to making them more acceptable to the investing public.

This action was authorized by the legislature at its last session, but it would have been easy to nullify it by naming a commission which would accomplish nothing practical.

It is evident, however, that Governor Haines is in sympathy with the movement and intends that something of value is to be attained, as the men he has named on the commission are not only practical in their views on the subject, but are intensely in earnest. They comprise:

James E. Clinton, Jr., of Boise, a banker.

Oliver O. Haga, of Boise, a man versed in irrigation law.

J. M. Thompson, of Caldwell, a lawyer, who has been active in the organization of irrigation districts.

Fred W. Hastings, of Wendell, a farmer, noted for his common sense and success.

Paul Bickel, of Twin Falls, engineer, who has much to do with laying out irrigation projects.

Thus the various interests are represented. It is the duty of the commission to suggest means by which the issue of irrigation securities may be made fair to both promoters and water users, and at the same time attractive to investors. Something of this kind is sorely needed.

International Irrigation Congress Mixup.

A Salt Lake paper states that there is now a strong probability that the International Irrigation Congress will not hold a meeting this year. The last session was held in that city, and Phoenix, Ariz., was chosen as the next meeting place, but that city has been unable to satisfy the executive committee of the Congress that it is in a position to care for the large number of people who will attend and so the meeting has been called off. Since that time, Butte, Mont., and several other western cities have invited the congress to meet there, but the Board of Governors fear a failure, owing to the lateness in calling the meeting at a new place, and has suggested to the executive committee that no meeting be held before 1914. The matter has not, however, been definitely settled as yet.

There is much to be commended in the suggestion made by Governor Oddie of Nevada at the recent conference of governors of western states at Salt Lake City, to the effect that the payments to be made by settlers on arid lands be graded. It is Governor Oddie's idea that these payments should be lighter for the first three years than they are later. This is sensible. The first years of a new-comer in a new country are always hard ones no matter how beneficent and inviting the conditions may be, and it is then that he needs relief from the onerous load of debt.

Good work is being done by the Panama commission of Idaho in working up a sentiment favorable to the making of a liberal exhibit of the agricultural, horticultural, livestock and poultry resources of the state at the San Francisco exposition. It would be a big thing for that part of the country.

Judge Davis, of the Idaho bench, has ruled that a water company has a lien on the water rights it sells until payment is completed, and that this lien is independent of any claim on the land itself, so that the fact that a patent has not been granted on the land by either the federal or state government does not enter into the question, the two properties, the land and the water right, being entirely separate and distinct.

PLAIN FACTS ABOUT IRRIGATION PROJECTS.

By W. J. Jackman.

It is no longer necessary to argue the merits of irrigation. Those are now universally admitted, especially by intelligent people who have taken the trouble to advise themselves thoroughly on the subject. It is a well known fact that there are millions of acres of land in this country, arid lands, on which nothing except sage brush and jack rabbits can be grown without irrigation. It is an equally well known fact that, once water is supplied to these lands in reasonable quantity, they become immensely productive. Crops of all kinds are grown in profusion, and of excellent quality. This is true as to grain of all kinds, hay, alfalfa, vegetables, fruits and live stock—cattle, horses, hogs and sheep. The scientific farmer, the man who knows how to do things in the proper way, who has given irrigated lands a fair trial, will never willingly go back to the old system of depending upon nature. This is simply because with a smaller initial investment and less effort he can make more money than is possible in following old methods.

This being so—and the fact is indisputable—one would naturally think that there would be a great rush to take up irrigated lands, and so there is in some sections, but the movement is not so general or widespread as it might be. Why? Let us face the conditions frankly and fearlessly. It is undeniable that there are too many so-called irrigation projects which have fallen far short of realizing the expectations and hopes of those who have been led (misled might be a better word) to invest in them to the extent of buying alleged water rights. As a result there is serious disappointment. Bad news travels fast, and people are too prone to accept it as gospel truth without verification as to the cause.

There has been very little downright dishonesty in irrigation projects. Most of such failures as have occurred may be traced to poor management or lack of capital. In no instance can they be charged to any defect in the theory of irrigation itself. This is immutable, unchangeable. The same tomorrow as it was yesterday, the same a thousand years from now as it is today. Poor management, lack of ordinary business sense, has in some cases led the promoters of projects to attempt to furnish water to too large an area of land. Either the work or the supply itself has been insufficient and the result has been disastrous to those attempting to farm the lands. They could not get the required quantity of water at the required time and their crops have withered and died.

Lack of means to complete the works on the contemplated scale has been another cause of disappointment. People have taken up land only to find that the expected supply of water was not within miles of them, and there was no prospect of getting it within a reasonable time. These things

hurt. They create a wrong impression as to the legitimacy of all irrigation plans and the honesty of the promoters.

Fortunately such instances are rare. The large majority of projects have been carried to a successful conclusion, but this does not alter the fact that one failure, or partial failure, tends to create a bad impression that a hundred successes will not overcome. People who have taken up arid lands and then find that the promises made to them are not being kept, become disgusted and discouraged. They write back home, the news spreads among their friends and neighbors, and the outcome is that a worthy enterprise—that of reclaiming the desert lands—gets a black eye. It matters not that thousands of people are prosperous and happy on irrigated farms. Let two or three in another section fail to get what they have been led to believe they would get, and the damage is done.

The splendid work which has been accomplished in the Twin Falls region of southern Idaho is a shining example of what intelligent management and ample capital on the part of those installing the irrigation plants will secure. A country which seven years ago was nothing but a wild sagebrush plain, is now the scene of thousands of highly productive farms and orchards, many thriving towns and villages, and one modern city (Twin Falls) of from 8,000 to 10,000 people. The census of 1910 gave Twin Falls a population of over 5,000. (Then only three years old.) Since then it has grown very fast. It is not a frontier town. It is a thoroughly up-to-date city with handsome buildings, electric railway, steam road (the Oregon Short Line) and all the most approved of modern conveniences.

This is the result of irrigation properly planned and carried out. The people who have settled there are growing rich, some by farming, some by fruit culture, others by raising live stock, and others still by following professional and mercantile pursuits. Farms originally taken up under the Carey act at a cost of from \$40 to \$60 per acre (including perpetual water right) are now in demand at from \$150 to \$200.

Similar results may be obtained under similar conditions in other parts of the country where irrigation is a necessity, but it requires ample means on the part of the promoters and honest, intelligent administration. It is undeniable that in a number of enterprises these factors have been lacking. The practice of inducing people to buy alleged water rights before those in control of the same are ready to deliver water is a mistake. It is worse, but we will not use harsh language. The men who planned and carried out the Twin Falls project have invested in various ways the enormous sum of \$18,000,000, but they have got something to show for it. So have the people who have bought water rights. There has been no disappointment, no failure to live up to promises. So far as work done by mortal man can be eternal the entire Twin Falls plant, the dams, the canals, etc., is built for eternity. Nothing short of some gigantic convulsion of nature can disturb it.

Uncle Sam and the various States safeguard

the settler in the matter of acquiring public lands. Why wouldn't it be an equally good thing if these authorities would also take supervisory charge of all irrigation projects? The writer is free to say that he has no well-matured, comprehensive plan to offer, but such supervision as may be put in effect should include the following points:

Abundant capital under control of the promoters to ensure completion of the project as approved by the authorities. Area of country to be irrigated to be restricted closely to that which may be properly watered from the supply at hand. In other words, the promoters to be compelled by the authorities to deliver the goods they sell.

No honest man will object to this. It may be claimed that regulation of this nature would tend to confine irrigation projects to capitalists. So it would, but this is what is needed. It is unjust, even cruel to the general public, to allow promoters with a capital of only \$1,000,000 to undertake a work which every expert knows can not be carried out for less than \$3,000,000, and may cost \$5,000,000, it usually means partial or complete abandonment of the work before it is completed. Who are the sufferers? The people who, relying on the promises of the promoters, have bought so-called water rights. It is equally unjust and cruel to allow men who know their water supply is only sufficient to moisten 50,000 acres to induce people to settle on 100,000 acres, and buy rights for that amount of territory.

These things need regulation, real, not farcical, regulation, and the sooner it comes the better it will be for the settler, the irrigation-plant promoter, and the country in general. It will mean the opening up to civilization and cultivation of an immense area of land, making it highly productive, and bringing wealth, not only to the individual but to the community, building up sections which would otherwise remain barren. It should be borne in mind that the wealth of a country is in its soil. The richer and more productive the soil, the better off the country is in every way. The United States is peculiarly situated in this respect. Nearly all the tillable, non-arid land is occupied. There is a marked scarcity of farm products and prices are continually advancing. Unless there is a radical change in the conditions now governing the production of our food supplies we are in danger of being at a comparatively early day brought rudely face to face with the Malthusian proposition in its worst form. Social economists endeavor to assure us that there can be no such thing as over-population; that the more people a country contains the happier its lot. This sounds well, but what if the country is unable to produce food supplies in sufficient quantities at a reasonable price to keep those people alive?

There is a limit to the earning capacity of the average individual. There is bound to be a corresponding limit to the price which he can afford to pay for sustenance. One of two things must happen: The people must starve, or they must revolt. Either contingency is horrible to contemplate. History tells us what happened in the days of the French revolution. Conditions were then strikingly similar in that country to what they are now in this.

We may rail at the extravagance of the working class, and with good reason. But this does not controvert the fact that food supplies are daily becoming scarcer and consequently dearer and more difficult to get.

But there is a remedy at hand. There are millions of acres of land in this country which may be made highly productive if water can be brought to it. This is the work of the irrigationists, the men who plan and build irrigation plants. But of what use is this work unless people can be found to till the soil after the water is brought to it? And for how long are we going to be able to find people willing to invest their time and money in this effort unless they are assured of government protection? The goose that lays the golden egg should be cared for by the community, even though it makes its owner rich, for the wealthier the individuals in a community the better off is the community itself. There will, of course, always be men like those who have brought to completion the successful work at Twin Falls but, unfortunately, these are all too scarce for the pressing needs of the country.

It is not enough to say that people settling on irrigated lands should be careful with whom they deal. This is true to a great extent, and is an ample explanation of why men who have made a great success of one irrigation project have no trouble in finding settlers for another. Their reputation warrants it. Unfortunately there is a limitation to the work which can be undertaken by men of this kind and if the wants of the country are to be met, we must depend to a large extent upon what others not so well and favorably known will do. This makes the requirement for official regulation and supervision a pressing one. It is not alone the individuals who are disappointed in their locations who must be considered. We must have ever in view the effect such disappointments are going to have upon others. And this is a serious consideration at a time when it is essential that every available acre should be brought under cultivation.

The ultimate success of this country lies in irrigation. It is the one thing which will banish starvation and penury; make us happy and prosperous. Let us safeguard it in an effective way.

Twenty years ago there was no great, insistent demand in this country for irrigation, the conditions then existing did not require it. Today it is a necessity. Twenty years from today it will be even more of a necessity. We must practice it on a more extended scale, or perish. Why not so shape our affairs now that we will be in position to reap the full benefits of this vitally necessary system of agriculture when the time comes that it must be generally practiced if we are to avoid a terrible calamity? Irrigation has come to stay. It will thrive, no matter how badly it may be handicapped, but we can get much better results by treating everybody fairly and this is what must be done if we are to secure the best it is capable of giving us. Half-way measures will not answer. They merely mean temporizing, experimenting, with the life-blood of the nation.

COLONIZING BY THE STATE OF VICTORIA, AUSTRALIA.

Australia has an area somewhat larger than the United States of America. Yet there is only a population of less than five million people in this great island continent of the southern hemisphere.

The Hon. James Bryce, until recently British ambassador at Washington, who lately visited the country observed: "Having now seen a good deal of Australia, I am impressed with the necessity—about which I do not think there can be any difference of opinion—of more rapidly and effectively peopling it." The commonwealth government



MR. F. T. A. FRICKE,
Official Representative Government of Victoria, Australia,
San Francisco, Cal.

being in sympathy with this contention has extensive propaganda promoting immigration and is alive to the importance of increasing the population and commerce. The regulations are such that all white people of a desirable class are welcomed. The progress is not, however, so fast as with other countries with less restrictive conditions, though effective plans in England have resulted in new arrivals to the extent of 100,000 per annum.

The government of each respective state has a separate land colonization system. This article

deals with the policy of Victoria, and the government of this progressive state has commissioned an official representative in North America. Mr. F. T. A. Fricke, who has recently been appointed as such, is a Victorian government official from that country and with established central offices at 687 Market street, San Francisco, Cal. This is regarded as the present front door of America for Australia until possibly the opening of the Panama canal may effect some change.

The prospects of increased trade are encouraging between these two English-speaking peoples on the Pacific ocean and the establishment of the above representation is the outcome of the visit of several delegations previously dispatched from Victoria. To promote a better understanding, the authorities are confident that a sprinkling of Americans among the rural population is likely to be effective. With this object Mr. Fricke is organizing, on behalf of his government, an excursion to Victoria next November at greatly reduced rates for a single journey, and also for return passages to enable others to make inquiries on the spot. The party will be conducted over state-owned railways free of charge to allow of the fullest opportunity of inspecting and inquiring into the conditions offered by Victoria.

This season of the year is chosen as it is then the fall in America, but spring-time in the Antipodes. Too much importance cannot be attached to this feature as one offering advantages for production for the world's market in the northern hemisphere. This is evidenced in the extensive trade with Europe in butter, fruit and other produce, for the handling of which a fleet of no less than 150 ships (with cold and frozen storage) is required per annum.

Victoria, the southeastern state of Australia, is situated in a latitude which gives it a climate similar to that of California. The configuration is, however, east and west instead of north and south as with the state of the Golden Gate, and thus very uniform temperatures prevail throughout. There is an average annual rainfall of over twenty-five inches per annum and owing to the favorable conditions for production, Victoria is known as "The Garden State of Australia."

Land Settlement.

Apart from the general conditions of settlers obtaining state lands not yet developed, the government has an active closer settlement policy. Large tracts in the past have been parted with by the state, but with the progress of civilization are gradually becoming within the bounds of good communication and now found to be more suitable for intensive farming. The government has power to resume such lands, which are then cut up into smaller holdings. By these means there are always splendid lands available for settlement purposes, no matter whether for alfalfa, corn, root crops, cereals, citrus or deciduous fruits, and general farming.

A considerable territory admirably suited for irrigation has also been brought under this policy, and the government has several systems which have entailed an expenditure of nearly \$20,000,000. The principal of these is what is known as the Goulburn

Valley, wherein is commanded an area of over 1,000,000 acres. Much of this land has been subdivided during the past two years and successful settlements are revealed in all directions. All of the water in the rivers and lakes throughout Victoria are state-owned. The government is thus in a position to effect state conservation works and channels, which provide adequate supplies at a cost which is calculated at a minimum for the settler who pays only sufficient for working expenses and sinking fund.

Victoria has taken measures to secure the best results possible by placing these systems in charge of an eminent engineer, Dr. Elwood Mead, formerly chief of irrigation investigation, Washington, D. C., thus affording the benefit of American experience and successful examples.

To promote settlement much government assistance and encouragement is rendered, so much so that it is regarded that a settler need not be other than successful, and Dr. Mead states "that under the conditions no man who will work need fail and every man who longs for a home can secure it. Men are obtaining homes on these lands with less hardship and often less outlay than was required to subdue the wilderness when the land was a gift." The terms for obtaining the freehold of these closer settlement lands require only a 3 per cent deposit of the capital value of the allotment with succeeding half-yearly payments extending over thirty-one years. Settlers can rely upon having neighbors as all are required to live upon their land and there is therefore no isolation but the company of half a dozen smiling homesteads within sight.

In order that a beginner may have the maximum of his resources at his disposal, the state will build houses and allow fifteen years for payment,



GOULDBURN WEIR, VICTORIA, AUSTRALIA,
With a Party of American Landseekers in the Foreground. 1912.

thus also saving any hardships for the women and children to wait for the erection of shelter. The settler can get to work immediately to obtain returns from his land. The state is also prepared, if requested, to grade and cultivate portions of settlements, allowing up to ten years for payment and has experts whose services are available free of charge to advise how, when and what to cultivate, prices and quality of stock, produce and imple-

ments. These simplify a man's dealings, save him much time and money in consequence of having to operate in a new country under what may be regarded as new conditions.

As it must be recognized that the first couple of years necessarily require a good deal of outlay, the state is also prepared to advance money for any purpose, up to 60 per cent of the value on all



GOULDBURN WEIR, VICTORIA, AUSTRALIA.
Showing the Gates Down with Water Flowing Over. One-tenth of the Flow of This Stream is Diverted by This Dam for Irrigation Purposes.

improvements effected by the settler, so that no delay need occur for development and thus reaping the benefits by the purchase of more stock and implements that may be required.

Satisfactory results are attending these efforts and many American settlers are among those who have gone to Victoria and already achieved prosperity from the excellent advantages offered for colonizing by the state of Victoria, Australia.

FOREST NOTES.

The Balkan War has brought about a rise in certain lumber prices in Europe because of the big demand for wood for ammunition boxes.

Dogwood, the principal source of shuttles for use in cotton mills, is growing scarcer year by year, and various substitutes are being tried, but with no great success.

The officials of the Yosemite National Park are co-operating with the forest officers of the Stanislaus and Sierra national forests for fire prevention and control in both the park and the forests.

Experiments with a tree planting machine at the Utah Agricultural Experiment Station indicate that it may be used to advantage in reforesting old burned areas on the national forests.

The leading forest schools of the country not only have their own forest tracts for continuous experiments, but give their students actual experience in the woods by having them take part in big lumbering operations.

That further diversion of the waters of the Colorado River above Yuma will be a menace to both the Imperial Valley and Yuma irrigation projects, will be urged before Secretary Lane by the receivers of the California Development Company.

ALFALFA SHOULD BE GROWN ON EVERY FARM.

These Charts Set Forth the Reasons Why Every Farmer Should Grow Alfalfa.

By J. E. Buck, I. H. C., Agricultural Extension Department

It is a profitable crop because of its abundant yields, three harvests being nothing unusual in the Corn Belt states. The average yield of alfalfa is about double the average yield of clover.

Alfalfa increases farm values because it enriches the soil instead of depleting it as grain crops do. Corn, or wheat, or any other grain crop grown on alfalfa sod yields much more abundantly than the same crops grown on the same field before alfalfa was grown there.

Alfalfa is the premier crop—because it excels every other crop in yield per acre—in feeding value—as a drouth resister—and as a soil enricher. Alfalfa is no harder to grow than clover, and therefore because of its many excellent qualities should be grown on every farm. No farmer can do better than to follow the admonition of this chart, and

and the average acre value of the crop was \$31. During the same year, the combined acreage of timothy and clover averaged 1.6 tons per acre, valued at \$14. It costs no more to grow an acre of alfalfa than it does to grow an acre of timothy or clover. Therefore, assuming that the cost of growing an acre of clover or timothy to be \$10, the farmer would clear \$4 per acre in growing these crops, whereas the same farmer if he grew alfalfa would reap a profit of \$21 per acre. This is a very strong chart, and should be carefully studied by every one who is interested in making the farm more profitable.

Alfalfa Out-Yields Other Hay Crops.

By means of a series of experiments carried on over a number of years, the average yield of alfalfa per acre has been found to be 5.4 tons, whereas red clover yielded only 2.5 tons; timothy 2.3 tons; brome grass 1.3 tons. Not only does alfalfa yield more than twice the tonnage of red clover, but it also makes a much more valuable feed.

In view of the foregoing, why should the farmers of the United States keep on growing 50,000,000 acres of timothy and clover, and only 5,000,000

ALFALFA HIGHEST IN DIGESTIBLE PROTEIN PER ACRE	
ALFALFA	875 LBS
CLOVER	491
OATS & PEAS	350
CORN ENTIRE CROP	300
BAGAS	279
MANGELS	232
TIMOTHY	228
SUGAR BEETS	213

ALFALFA SHOULD BE GROWN ON EVERY FARM	
1	IT IS A PROFITABLE CROP
2	INCREASES FARM VALUES
3	EXCELS EVERY OTHER CROP IN YIELD PER ACRE IN FEEDING VALUE AS A DROUTH RESISTER AS A SOIL ENRICHER
4	NO HARDER TO GROW THAN CLOVER
5	MAKE A BEGINNING-----START NOW GROW SOME ALFALFA
6	MOTTO
ALFALFA ON EVERY FARM	

GROW YOUR PROTEIN DONT BUY IT	
ALFALFA EQUAL TO BRAN	
BRAN COSTS	\$21 PER TON
ALFALFA	5.15 " "
RENT FOR FIVE YEARS	\$25.00
SEED	2.00
PREPARATION AND SEEDING	5.00
MANURE LIME INOCULATION ETC	4.00
CUTTING 12 TIMES	36.00
	\$72.00
TOTAL YIELD FIVE YEARS 14 TONS	
\$72.00 ÷ 14 = \$5.15 COST PER TON	

make a beginning to grow some alfalfa. **START NOW.**

Alfalfa in the United States.

Only about 5,000,000 acres of alfalfa are grown in the United States today, as compared with about 50,000,000 acres of timothy and clover—46,000,000 acres of wheat, and more than 100,000,000 acres of corn. Of the 5,000,000 acres under alfalfa, only 218,000 acres of this crop is grown east of the Mississippi River.

As you will note by referring to the chart, nearly 1,000,000 acres of alfalfa, or one-fifth of the entire area, is grown in the state of Kansas alone. In the rank of states growing alfalfa, Nebraska is second; Colorado, third; California, fourth. The great Corn Belt states such as Iowa, Illinois and Wisconsin, rank very low in the production of alfalfa—and it is in the Corn Belt states, therefore, that the need for growing alfalfa is found to be the most urgent.

Alfalfa the Most Valuable Forage Crop.

According to the 1910 census of the hay crop, the state of Wisconsin grew 18,000 acres of alfalfa which averaged 2.8 tons per acre for the entire state,

acres of alfalfa? Would it not be much more profitable to simply reverse the figures, and grow 50,000,000 acres of alfalfa and only 5,000,000 acres of clover and timothy? Think it over.

Save the Alfalfa Leaves.

Of the entire alfalfa plant, the stalk comprises 60 per cent, and the leaf 40 per cent, whereas, the quantity of the protein in the stalk is only 40 per cent, while the protein in the leaf is 60 per cent. Moreover, only 20 per cent of the fat is to be found in the stalk, while 80 per cent is in the leaf. It is, therefore, very important that the alfalfa be harvested at the proper time, and carefully handled so that all the leaves will be saved.

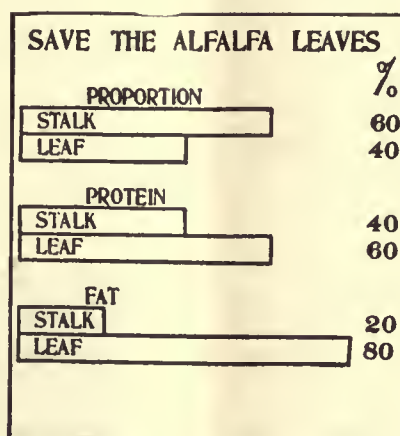
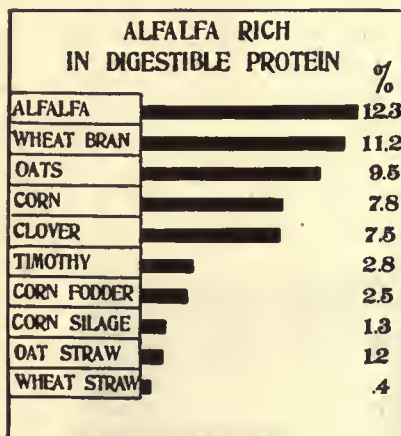
Alfalfa Is Rich in Digestible Protein.

Of all crops alfalfa stands at the head of the list, alphabetically and otherwise. In the matter of digestible protein, alfalfa leads with 12.3 per cent, surpassing even wheat bran by 1.1 per cent. This chart presents some startling disclosures as to the great value of alfalfa, but it may not be very easy for every one to understand the full meaning expressed in percentages. Therefore, another chart

has been prepared showing that alfalfa ranks highest in digestible protein per acre.

Alfalfa Is Highest in Digestible Protein Per Acre.

We believe every one can understand this chart, which is expressed in very simple terms. By careful analysis it has been found that alfalfa yields 875 pounds of digestible protein per acre, as compared with 491 pounds in clover. This is a very remarkable showing in favor of alfalfa.



ALFALFA MOST VALUABLE FORAGE CROP

WISCONSIN HAY CROP - 1910

	ACREAGE	AVE. YIELD	VAL. PER A.
ALFALFA	18,000	2.8 TONS	\$31
TIMOTHY	767,000	1.4 "	14
CLOVER	119,500	1.7 "	14
TIMOTHY AND CLOVER	1,600,000	1.6 "	14

Protein is the most essential element in feed stuffs; therefore, it will readily be seen how valuable alfalfa is as compared with clover, oats and peas, corn, timothy, or sugar beets.

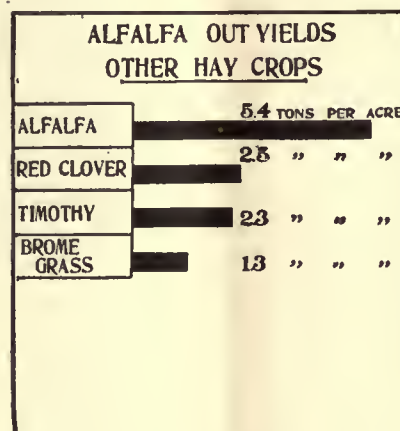
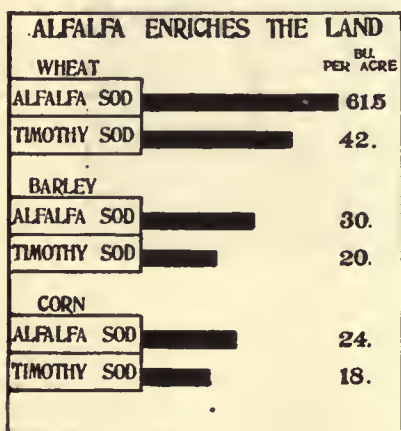
Grow Your Protein—Don't Buy It.

By careful analysis it has been found that alfalfa is equal to bran in protein content. Wheat bran costs about \$21 per ton, whereas alfalfa can be grown for \$5.15 per ton, as shown by the figures presented on this chart. Why should any one buy

Hon. A. P. Grout, president of the Illinois Alfalfa Growers' Association, says: "I know of nothing which will do more for the development of the state, or add more to its wealth, than a thorough knowledge and understanding of alfalfa."

LANE TALKS.

"The man who makes a farm and irrigates is the man I am primarily interested in, not the land speculator," says Secretary Lane. "We have been



ALFALFA IN UNITED STATES

	ACRES
KANSAS	975,000
NEBRASKA	685,000
COLORADO	509,000
CALIFORNIA	484,000
IDAHO	309,000
OHIO	29,000
IOWA	29,000
ILLINOIS	18,000
WISCONSIN	18,000
MICHIGAN	7,000

wheat bran when it costs four times as much as alfalfa, and alfalfa makes just as good, or even better, feed than wheat bran?

Alfalfa Enriches the Land.

Not only does alfalfa yield much more abundant harvests than the other forage crops, but it enriches the land, while it yields rich harvests for the farmers. The experiment set forth in the accompanying chart was made in Canada, where it was found that alfalfa sod yielded 61.5 bushels of wheat per acre, as compared with 42 bushels of timothy sod. Barley yielded 30 bushels per acre on alfalfa

making money for land speculators, not homes for farmers, on some of our projects. I find that we have under our irrigation projects 1,200,000 acres of irrigable land, land upon which we are prepared to deliver water, but we are irrigating only 650,000 acres. Over 95 per cent of the remaining 550,000 acres—all irrigable but unirrigated—is land in private ownership. The man who irrigates his land should have the easiest terms from the Government because he is the one who is giving the public the benefit of that land. The people of the

(Continued on page 292.)

IRRIGATION POSSIBILITIES OF WESTERN SOUTH DAKOTA*

By SAMUEL H. LEA, State Inspector

In considering the possibilities of agricultural development in western South Dakota one can not fail to be impressed with the vastness of the field and the splendid opportunities for the application of scientific methods. That portion of South Dakota west of the Missouri River comprises a total area of 42,219 square miles or 27,020,160 acres. About 56 per cent of this area, or approximately 15,000,000 acres, comprises land whose surface is level to rolling and will permit the use of farm machinery with little difficulty. These figures are taken from Reports of the United States Department of Agriculture; they may be considered fair and conservative.

On account of the large proportion of the region held as reservations for the Indians, the development of western South Dakota has been greatly retarded. The great Sioux Reservation which extended from the Missouri River westward almost to the Black Hills, and from Nebraska northward into North Dakota, covering nearly one half of the state west of the Missouri; not only precluded any settlement in the region actually included within its boundary, but also served as a barrier to the development of that part of the state lying west of it. About one-half of this reservation was opened to settlement in February, 1890, and a gateway for the advance of cultivation beyond the Missouri River was thus provided. Other portions have since been opened until now a considerable area is open to settlement.

In 1907 came the building of the Chicago, Milwaukee and St. Paul railroads from the Missouri River to Rapid City, as well as the Pacific Coast extension of the latter road through the northern part of the state. These opened up large stretches of country and gave a new impetus to settlement. Land along these lines was rapidly taken up and homeseekers pushed far away from them into the country. Houses sprang up over night and the development of western South Dakota took on a new meaning. The cattlemen were hemmed in on every side by homesteaders. Towns were laid out which soon grew to be prosperous villages, and today there are many settled communities where comfortable houses, commodious barns, and adequate farm equipment give the best evidence of a permanent population.

During the first few years the rainfall was above the average and crops were fairly good. Later experience has shown, however, that years of insufficient rainfall must be expected and that irrigation must be provided to insure good crops every year. The necessity for irrigation being recognized it is important to know first the water resources of the region and next the amount of land that can be irrigated to advantage.

Water Resources.

The principal streams in western South Dakota are the Grand, Moreau, Cheyenne, and White Rivers.

These streams flow through narrow valleys with high, broad terraces, considerably lower than the adjacent country. The flow of water in these streams fluctuates greatly according to the season of the year. Their fall is from an altitude of about 3,500 feet along the west end of the state outside of the Black Hills, to the level of the Missouri River, amounting to nearly 2,000 feet. The length of the Cheyenne River within the state is about 500 miles and that of the three other rivers is about 400 miles, consequently their currents are swift and rapids are frequent. The Cheyenne and its northern branch, the Belle Fourche, almost completely surround the Black Hills. Some of the smaller rivers draining a considerable area are the Teton or Bad River, on the divide between the White and the Cheyenne, the Little White River in the Rosebud and Pine Ridge Indian Reservations, the Keya Paha in the Rosebud



SAMUEL H. LEA.

Indian Reservation, and the Little Missouri, cutting across a small section in the northwest corner of the state. These streams are dry in places in summer, but at some seasons they carry an immense volume of water.

Other Streams.

In the region adjacent to the Black Hills the following streams are capable of being used for irrigation: Rapid, Sulphur, False Bottom, Bear Butte, Elk, Alkali, Box Elder, Spring, French, Battle, and Beaver Creeks. These all have a practically continuous flow, although, like many other streams in the state, the flow is very small in the dry season. In some cases they pass over limestone strata in some portion of their course and the water sinks underground. In flood periods, however, the flow is suffi-

*Address at State Conservation Congress, Pierre, S. D.

cient to pass over the strata and go the entire length of the channel.

Water Storage.

The storage of flood waters is true conservation for there is no gift of nature more highly appreciated in our western country than water. In view of the fact that our streams become at times raging torrents, carrying vast quantities of flood water down their channels thus causing waste and devastation, it is considered essential that some means should be provided for conserving at least a portion of these waters by means of storage.

There are many thousands of acres of land in the western part of the state that are unproductive because of lack of irrigation water. At the same time in all our streams immense volumes of water run to waste during flood seasons and are lost to use. The obvious remedy for this condition of affairs is the construction and maintenance of storage reservoirs for holding back the flood waters. In this way the reclamation of 100,000 acres of land is made possible under the Belle Fourche Project by storing the flood waters of that stream.

The development of irrigated farming will eventually reach a stage where the construction of storage reservoirs for stream flow will become an important factor. Where the stream is one of considerable size, numerous irrigation canals will be constructed from it and its entire normal flow will thus be utilized; and means will be provided for holding back the vast quantity of water that goes to waste during the periods of high water, so as to render it available for use in the drier part of the year. By such methods many large areas of land will be made highly productive.

Large Projects.

In considering the economic feature of irrigation development it should be kept in mind that a few large projects where practicable are preferable in many ways to many smaller ones. There is less waste and more saving in operating and construction expenses in a well managed larger project than in several small ones for the same area where the cost of supervision and maintenance is multiplied. It is not by any means intended to disparage small irrigation projects since they are often possible when large projects cannot be considered.

A good example is afforded in the Belle Fourche Reclamation Project, now nearly completed. This great project will comprise nearly 100,000 acres of irrigable land with an ample water supply. There are now many hundreds of settlers on this project and comfortable homes, gardens and trees may be seen on eighty-acre tracts where until recently wild grasses grew and cattle ranged at will.

Small Projects.

In many localities it is not practicable to construct large works for irrigating large areas, since there is no considerable water supply available for local use. Many places that are too high above flowing streams to be irrigated by gravity flow can be furnished with a supply of water by means of pumping, and hundreds of acres are thus irrigated in small units.

An important factor in the irrigation work of the state is the use of small reservoirs for irri-

gating small tracts of land. There are many such reservoirs in western South Dakota, situated on the prairies above the reach of gravity flow or even of pumping from streams, and dependent on the precipitation upon the catchment area above them for water supply. While the area irrigated from an individual reservoir of this nature is necessarily small, the aggregate area reclaimed by them all is quite large. The number of small irrigation projects of this character is rapidly increasing and much good will result therefrom.

While individual enterprise is producing such good results in a small way, public interest is becoming aroused concerning the possibilities of reclamation on a large scale.

Proposed Work.

Referring to the map of the state, it will be seen that there are some excellent locations for large irrigation projects in the great plains area, west of the Missouri River and outside of the Black Hills region. Beginning in the northwestern corner of the state we find the Little Missouri Project, comprising 40,000 acres of land in Harding County. In Perkins County is the upper Grand River Project, adjacent to the North Dakota state line. This is part of a complete project, the larger portion of which lies in North Dakota; the South Dakota portion comprises about 4,000 acres; lower down Grand River, in Perkins County, there is opportunity for another project taking in about 18,000 acres of land. No surveys have been made for this project and its exact location has not been determined. It is known that there is sufficient water available, provided suitable reservoir sites can be found. Further south on the Moreau River there is opportunity for the irrigation of about 30,000 acres. This project is subject to the same conditions as have been stated. There is excellent land and ample water supply available. It only remains to locate suitable storage basins for conserving the flood waters.

In northern Stanley County a tract of about 65,000 acres can be irrigated from the Cheyenne River by means of gravity flow through a canal and storage reservoirs. This project has not been investigated and no definite information can now be furnished concerning it, although we hope to make surveys for it later on.

The Box Elder Project, in Pennington County, a few miles north of Rapid City, will comprise about 15,000 acres of land. There is a splendid dam site, a fine basin for storage purposes and some of the best land in the state suitable for irrigation.

The largest irrigation proposition that has been considered in the state is the Cheyenne Valley Project. This will comprise the diversion from Cheyenne River of a large portion of the flood waters of that stream, and carrying same by gravity flow to a storage basin in the Bad Lands. From there the water can be conveyed to the lands in Pennington and Stanley Counties and used for irrigation. A partial reconnaissance has been made for this project, but it will be necessary to make further surveys to determine its feasibility.

Another project, which has been surveyed and declared feasible, is in Rapid Valley. This will do much toward developing the fine valley of Rapid

Creek, east of Rapid City; there are about 50,000 acres to be irrigated.

In White River valley are two proposed developments; these are both on the north side of the stream. One of these is near Kadoka; the other is near Draper and Vivian. The Kadoka project comprises about 30,000 acres, and the lower White River project comprises 50,000 acres of land. Both of these require surveys before their feasibility or exact locations can be fully determined.

The Edgemont project is in Fall River County, near the town of Edgemont. This is one of the smaller projects, comprising about 10,000 acres. The water supply will be obtained from Pass and Beaver creeks.

Summary.

Summarizing the foregoing statements we obtain the following list:

RECLAMATION PROJECTS.

	Acres.
Little Missouri, Harding Co.	40,000
Grand River, No. 1, Perkins Co.	4,000
Grand River, No. 3, Perkins Co.	18,000
Moreau River, Ziebach & Dewey Co.'s.	30,000
Box Elder, Pennington Co.	15,000
Northern Stanley, Stanley Co.	65,000
Cheyenne Valley Pennington & Stanley Co.'s.	105,000
Kadoka, Stanley Co.	20,000
Rapid Valley, Pennington Co.	50,000
White River, Lyman Co.	50,000
Edgemont, Fall River Co.	10,000

Total407,000

Other irrigation projects of similar merit will probably materialize in the next few years. There are doubtless many additional opportunities for irrigation development in western South Dakota.

Missouri River Valley.

An irrigation possibility of great potential value is the reclamation of a portion of the valley of the Missouri River in this state. There are more than 100,000 acres in this valley susceptible of irrigation and we may reasonably expect that in time this large area will be brought under irrigation. Already there are many small pumping plants in operation along the river and much land is under irrigation therefrom.

Great Plains Project.

This stupendous proposition is so far reaching and comprehensive in scope that a volume could be written about it without exhausting the subject. Briefly, it comprises the division of a large volume of water from the Missouri River below the mouth of the Yellowstone, and the conveyance of this water across country through the states of North and South Dakota. By this means a large portion of the great plains area could be watered and brought into great productivity. Since this is an interstate project, it would properly come under Federal supervision.

What We May Expect.

Looking a few years into the future, let us endeavor to forecast the probable results of irrigation development in this state. We may reasonably expect, in the first place, that the extension of irrigation will result in the conservation of our surface

water supply, also in the more effective and economical use of water. Great reservoirs will be constructed in which will be stored hundreds of thousands of acre feet of water, for service in performing useful work instead of devastating the lower valleys during flood periods.

In the next place hundreds of homes will be provided and means will be furnished for thousands of people to obtain a good living on irrigated farms. Taking for illustration the project for irrigating 105,000 acres in Pennington and Stanley Counties, we may assume that a family of five people can occupy each 80-acre tract; this would mean a farming population of over 6,500 people with a corresponding urban population. The increase in land values from a price of say \$20 per acre to \$100 or over, would mean an aggregate increase of \$8,400,000 in farm lands alone. This is for one project; the entire number of projects, on a similar basis, would aggregate an enormous total.

The big ranch, with its great area of untilled pasture, will eventually be relegated to the higher lands beyond the reach of irrigation water. With the extension of irrigation we may look forward to the time when small farm units, intensely cultivated, will produce crops of high value. This will mean compact rural settlements with improved highways and schools and churches. It will mean an increased population of prosperous, contented people; and the luxuries and enjoyment of urban life will replace the comparative isolation of the farm.

Work of the State Engineer.

In conclusion, the work of the State Engineer's department will be briefly outlined. The determination of the feasibility of an irrigation project of magnitude requires engineering skill of a high order and a vast amount of preliminary work. Examinations and surveys must first be made to determine water resources and physical characteristics; these must be thorough and painstaking in order of value. Investors and those who are interested in irrigation development require careful, unbiased reports before they will undertake development work or spend money on a project. It is proposed that the engineering department of the state shall make the preliminary surveys and examinations of reservoir sites, canal lines and irrigable areas. The results of such investigations are to be embodied in the form of maps, profiles and reports to be placed on file at the State Capitol for public information. Prospective investors can then obtain at first hand such preliminary information as will be necessary to show the feasibility of individual projects. This information will be reliable, authentic and fully trustworthy.

We are now at the threshold of irrigation development in this state. Let us go forward in the good work of making this vast region a garden spot, rendering possible the growth of our population and commerce, the building of prosperous cities and the transformation of the great plains area into a splendid agricultural region.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.

Supreme Court Decisions

Irrigation Cases

APPROPRIATION.

A permit to appropriate the public water at a point upon state lands, issued by the state engineer, is not a lease of the land where the location is made, neither is it a deed of sale of the land at a point where the water is to be taken. *Tobey v. Bridgewood*. Supreme Court of Idaho. 127 Pacific 178.

APPROPRIATION.

Diversion and storage of waters in a reservoir is not an appropriation thereof, but it must also be beneficially applied to lands. *Highland Ditch Co. v. Union Reservoir Co.* Supreme Court of Colorado. 127 Pacific 1025.

CONDEMNATION OF WATER.

That an irrigation company already entitled to appropriate a large flow of water devotes that flow to a use other than a public use is no defense to a proceeding for the condemnation of other water, which is to be devoted to a public use. *San Joaquin & Kings River Canal & Irrigation Co., Inc., v. James J. Stevenson*. Supreme Court of California. 128 Pacific 924.

WASTE OF WATER.

Though an irrigation company, entitled to take only a given amount of water, took more, and some of it was wasted, a party cannot maintain mandamus to compel the company to furnish him with the water thus wasted; the company not being a common carrier of water. *Thayer v. California Development Co.* Supreme Court of California. 128 Pacific 21.

IRRIGATION COMPANY'S RIGHT TO SUE.

An irrigation company, which by reason of the wrongful diversion of water from its canal has become liable to its stockholders and water consumers for failure to deliver water, cannot recover its damages caused by such liability from the wrongdoer until it has liquidated them. *Nevada Ditch Co. v. Pacific Live Stock Co.* Supreme Court of Oregon. 127 Pacific 984.

PARTIES TO SUIT.

Where, in an action between water appropriators, the relative rights to and the amount of water which each was appropriating were in issue, another water company, through whose ditches defendant claimed that the adverse party was diverting water, was a necessary party to the suit. *Biggs v. Miller*. Court of Civil Appeals of Texas. 147 Southwestern 632.

RIGHT OF RIPARIAN OWNER.

A riparian owner was entitled to the amount of water reasonably necessary to irrigate his land after making due allowance for that water which at times, by reason of the small flow, was so charged with mineral substance as to be useless for irrigation. *Biggs v. Lee*. Court of Civil Appeals of Texas. 147 Southwestern 709.

IRRIGATION COMPANIES.

Directors of an irrigation corporation, formed for the benefit, principally, of the lands of its promoters, could deal with the corporation and buy water rights therefrom as long as such dealings were open, fair,

and free from fraud, and on the same terms offered to others. *Paine v. Milton, Freeewater & Hudson Bay Irr. Co.* Supreme Court of Oregon. 127 Pacific 775.

SUIT BY IRRIGATION COMPANY.

An irrigation company, suing to recover over against the wrongdoer damages paid by it to its stockholders and water consumers because of the wrongful diversion of water, must plead such damages, giving the amount claimed and recovered by each water user separately and specifically. *Nevada Ditch Co. v. Pacific Live Stock Co.* Supreme Court of Oregon. 127 Pacific 984.

PROTECTION OF VESTED RIGHTS.

Under the express provisions of Comp. St. U. S. 1901, §§ 2339, 2340, vested and accrued water, ditch, and reservoir rights recognized by local customs are protected and confirmed, and patents are made subject to such rights, so that land occupied as a reservoir site under the state's permit at the time the land is selected and granted to the state is, when leased by the state, subject to such rights. *Bucknum v. Johnson*. Supreme Court of Wyoming. 127 Pacific 904.

SURFACE WATER.

Where surface water from surrounding country passed in its natural course, not over, but by plaintiff's land on either side, and when beyond it was intercepted by the embankment of defendant's railroad, it not having constructed enough or sufficient culverts to let pass through it the waters reasonably to be expected, and it there accumulated till it was cast back on plaintiff's higher land, defendant was liable. *Kroeger v. Twin Buttes R. Co.* Supreme Court of Arizona. 127 Pacific 735.

SELLING WATER RIGHTS OUT OF STATE.

A provision in the articles of incorporation of an irrigation company that the water is for use upon lands in U. county can only be taken advantage of by stockholders, and probably then only when prejudiced thereby, and is a limitation that may be waived, and an objection to the sale of water to be used out of the state which is made only as a means to avoid the whole proceeding of the board in providing for sales, and not to avoid a wrong to the corporations or to stockholders, is without merit. *Paine v. Milton, Freeewater & Hudson Bay Irr. Co.* Supreme Court of Oregon. 127 Pacific 775.

DAMAGES FOR BREACH OF WATER CONTRACT.

In such a case, the measure of damages is the value to plaintiff of the use of said right during the time he is deprived thereof, and it is not error to instruct the jury that the measure of plaintiff's recovery is the value of the crop at the time the water was shut out of said canal, with the right to irrigate it from that time to the end of the irrigation season, less the value of the crop without the right to irrigate it from that time until the end of the season. *Clague v. Tri-State Land Co.*, 84 Neb. 499, 121 N. W. 570, 133 Am. St. Rep. 637. *Peden v. Platte Valley Farm & Cattle Co.* Supreme Court of Nebraska. 139 Northwestern 1012.

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Reclamation Notes

COLORADO.

The division of engineering of the Colorado State College is unable to supply the demand for graduates in mechanical, electrical, civil and irrigation engineering. Many of the graduates have already left the college and gone with the United States Reclamation Service.

That the water users themselves will shortly have an opportunity to handle the irrigation projects under which they operate is the conclusion drawn by Colorado newspapers from a letter recently received from Director Newell. That the government is growing tired of its established policy of endeavoring to administer irrigation affairs from a distance is indicated by the Newell letter.

It is estimated that 10,000 farmers on reclamation projects throughout the west will be affected by the supreme court's decision recently that they must pay the government the cost of maintaining and operating the various reclamation projects pending their completion. This decision was in the suit of one D. P. Baker and other tenants on the Sunnyside unit of the Yakima, Wash., project to have the reclamation service enjoined from cutting off the water supply to enforce collections of such charges imposed under instruction from the secretary of the interior in 1902. Nearly \$1,000,000 have already been collected by the government and \$500,000 more is about due. The Colorado irrigation people are much interested in this subject.

Considerable interest has been aroused by owners of the water rights in Pueblo county, Colo., in appealing a case which came before the district court in Trinidad recently by attorneys representing the owners of the water rights, stating that if the contention of the plaintiffs who have asked the court for an injunction prevails, it will seriously affect the quantity of water which the irrigation ditches in Pueblo county will receive from the Huerfano river.

The outlook for crops in Colorado is reasonably good, so our Colorado exchanges state. There seems to be plenty of water all over the state, and the area of irrigated lands has increased considerably. Farmers there are satisfied that they will be able this season to pay off all indebtedness, and have substantial sums as nest eggs.

The new order issued by Secretary of State Lane will have its effect on the construction of reclamation projects in Colorado. The order is to the effect that henceforth the eight-hour law must be observed by contractors on government irrigation works.

OREGON.

The farmers and fruit growers have just organized a bonded irrigation district under the state laws of Oregon, which will cover approximately 30,000 acres near Hood River in that state.

Insisting that a decision on the case by the supreme court was necessary for the guidance of the future legislatures, State Treasurer Kay at a meeting of the Desert Land Board recently won the fight for an appeal of its state board by L. A. McMahan to enjoin the state treasurer and secretary of the state from paying out any part of the \$450,000 appropriated at the last session of the legislature for the reclamation of land in the Columbia Southern Irrigation Project.

E. W. Barr, local examiner for the United States reclamation service, held a conference recently with J. A. Mahan and the city council of Ellensburg relative to the water contract to be signed for the municipal plant of that town. The Ellensburg papers state that the reclamation service has made many important concessions to the city, and the proposed contracts will be of great benefit to local interests.

The Hall Construction Company has begun work on the South Drews canal near Lake View, Ore., and it is announced that the project will be completed within a year and many thousand acres of land on the west side of Goose Lake Valley will be under irrigation.

State Engineer Lewis of Oregon has approved a number of applications for water for the Harney Valley Reclamation Company. This project embraces about 54,000 acres, and it will require from four to six large reservoirs to impound water for this quantity of land.

NEVADA.

Governor Oddie, in an address at Salt Lake City, cited the fact that the Canadian government instead of asking the settler for money to start the farms is advancing them money to develop their holdings. He believes that the American states could follow the example to great advantage, as the average settler is short of funds, and that condition retards development.

In speaking of the vastness of unirrigated areas of Nevada, the governor said Nevada has 40,000,000 acres of stock range land on which 500,000 head of cattle and 1,500,000 sheep find sustenance winter and summer from the neutral flora. He stated further that Nevada has 12,000,000 acres of alkali deserts and verdureless barrens and 18,000 acres of rich, arable valley lands which can be reclaimed at a modest expense.

William Weaver, a farmer near Reno, Nev., has been experimenting with winter vetch, mammoth red clover and alfalfa, and showing the contrast between these plants. The winter vetch is a trailing, vine-like plant, and the sample shown

by Mr. Weaver was about four feet long. It is a leguminous plant and makes a good quantity of excellent food for all classes of domestic animals.

IDAHO

Senator Borah stated recently after a conference with Secretary of the Interior Franklin H. Lane that he had received assurance from the Secretary that he would include the Black Canyon irrigation project in the itinerary of his forthcoming swing around the circle. Senator Borah states that he is assured that the necessary extension of the project there will result in great benefit to Ada and Canyon counties.

There is a report throughout Idaho that the Western Pacific Railroad is to begin work upon an extension of its road from Nevada to Boise via Twin Falls. One of our exchanges states that work will be begun on this extension within a short time, and it is their intention to complete it by the end of 1914, in time for the 1915 traffic. The Western Pacific trunk line has become a wonderful money maker, so it is said, and this new branch line to Boise will tap 1,000,000 acres of irrigated land.

Governor Haines of Idaho has appointed Oliver O. Haga, the Hon. Fred W. Hastings and James E. Clinton, Jr., on a commission to improve the marketability of Idaho irrigation securities.

CALIFORNIA

Action has been taken by the Stanislaus County Board of Trade for the purpose of coming to some understanding as to the attitude of the merchants and business men of San Francisco in regard to the opposition of the irrigated districts of the San Joaquin Valley to the request of the metropolis for a reservoir supply in the Hetch Hetchy Valley. At a meeting of the board recently a motion was passed authorizing the president and secretary to at once confer with the Chamber of Commerce and set a date for a meeting of the representatives of the Modesto and Turlock irrigation districts with the members of the San Francisco body.

Mr. I. R. Anderson of McKittrick, Cal., has attracted much attention lately on his ranch near that city. A year ago Mr. Anderson decided to make an experiment in horticulture which, if successful, would mean much for the future of that portion of the state. Within a radius of 50 miles at that time, stood a solitary poplar tree. Thinking that the soil was favorable to the growth of this species, and realizing if success attended his efforts the result would mark a decided step in the direction of aiding the promotion of the timber industry, he planted a number of poplars which he obtained from Bakersfield. The young trees were placed at an average depth of 4 feet below the surface, the height above being about the same. They were set in regular distances from the border of a lake which insured irrigation to the extent required. The trees under the influence of favorable climatic conditions soon gave evidence of vigor, and today Mr. Anderson has a grove that promises to meet all his expectations.

A few years ago the Imperial Valley in Southern California was a desert. This year it is estimated that 50,000,000 cantaloupes will be shipped from this valley; more than 6,000 acres of melons are ripened there.

Extensive plans are being carried out by the Indian Branch of the Government for the installation of an irrigation system for the Indians of the Rincon Reservation, a few miles northeast of Escondido. A 40-horsepower gasoline engine has been installed on the reservation, and it will be used with a No. 6 pump.

The story of the reclamation of 100,000 acres of land in the West Delta of the Sacramento, how it was planned and executed in rapid time, was told the members and guests of the Advertising Association by Mr. Patrick Calhoun at a luncheon given in San Francisco recently.

After years of doubt and struggle, the Indians of Pala Reservation have obtained their patent from the United States Government. This important announcement was made recently by Walter Rumkey, Superintendent of that Reservation, in a brief address which he made at the opening of the new irrigation ditch from the head waters of the San Luis Rey River to the gardens of the Indians.

With a view to protecting thousands of land seeking immigrants who are to arrive in California by way of the Panama Canal, the legislature has sounded the knell of the grasping and unscrupulous land agent. Through the license system the honest real estate agent will come into his own, it is hoped.

ARIZONA

E. Miller, who is farming a tract of land near Douglas, Ariz., has proven a theory held by many farmers in that territory, viz., that wheat can be made to grow without irrigation and prove a profitable crop. On a one-acre experimental tract planted last October there is a fine stand of grain, the average stalk being more than three feet in height.

Mr. J. R. Burton of Salina, Kans., formerly United States Senator, has been at Phoenix lately on his way east after making an examination of the Arizona Land & Irrigation Company's property near Prescott, in which he is interested.

Reports of bad luck in the olive industries in various sections of the world have come to Arizona, which leads the people of that state to believe that the Arizona crop will be extremely high priced this year.

Chester A. Congdon, one of the leading citizens of Duluth, Minn., and a pioneer at North Yakima, Wash., has recently been visiting the southwest country, and has spent a considerable time in and around Phoenix. Mr. Congdon is a man of large means, and it is presumed that his visit to that section will at no distant date lead to investments in that section.

The Cochise County Damsite and Irrigation Company, composed of Los Angeles and Douglas individuals, and capitalized at \$3,000,000, has secured control of the water rights in Rucker Canyon in the Chiricahua Mountains for an irrigation project which will serve water and render fertile at all seasons a tract of several thousand acres in the Sulphur Springs Valley.

D. W. Hall of the Arizona Irrigated Land Company reports May as having been a very active month with his company, which recently took over the Avondale Ranch and Irrigation system near Avondale, in the Agua Fria section.

WASHINGTON

Labor is scarce in the Yakima Valley in Washington. Not only is the fact showing to the detriment of reclamation work at the storage reservoir operations at Lakes Keechelds and Kaches, but also in connection with ditch work and other construction nearer the city.

Apprehensive that Government work might be withdrawn from Montana, a delegation of citizens of that state called upon Secretary Lane recently to urge him to continue the projects. There is a probability that work in the four projects in Montana will be carried out as planned.

With the decision of Secretary Lane recently on the Moses Lake desert land litigation, a number of Tacomans had their title to \$2,000,000 worth of land situated 40 miles southeast of Wenatchee made binding. The decision affects 32,000 acres of land, said to be worth in the aggregate \$3,200,000.

WYOMING

Senator Warren has been notified by the Secretary of the Interior that the reclamation service has been given authority to furnish water users on the Shoshone irrigation project, Wyoming, water in excess of two acre feet without payment for such excess supply.

The prospects are good that Johnson Lake, covering 700 acres near Casper, Wyo., will this summer be utilized for irrigation and other purposes.

In the Laramie Valley, Wyo., farmers are facing another of those troublesome questions that arise in irrigation districts. Speaking of the contract submitted to the water users the *Laramie Republican* says: "In the contract referred to there is a provision withholding title from the water buyers for a period of 49 years. It is the understanding of this paper that it has been the general policy in such cases to turn over irrigation works to the settlers after a certain per cent of the rights have been disposed of—generally about 90 per cent—no matter what period of time has elapsed."

C. C. Carlisle, receiver of the North Platte Land and Irrigation Company, is making arrangements to repair the ditches, etc., of the company's system in the Platte Valley near Douglas.

NEW MEXICO

E. S. Dean of the City of Mexico, and formerly superintendent of the Excelsior Manufacturing Company, employing some 300 men in Mexico, located near Deming last year and has been farming there ever since. He was fortunate enough to clear \$110 per acre on a three-acre field of cantaloupes. He irrigated these with a small 2-horsepower gasoline engine.

The man who said "It can't be done" in connection with the irrigation project completed south and east of Santa Fe, New Mexico, has certainly been caught up with. Our old friend, Jay Turley, associated with a man named Anson A. Avery, have finally come into their reward. Recently the valve of the Arroyo Hondo dam was opened, and there are wonderful possibilities under the project.

The rapid reclamation of 100,000 acres of fertile land in the Estancia Valley east of Santa Fe, and of 20,000 acres above the gravity irrigation level along the Rio Grande north of Santa Fe, is already well under way as a result of the issuing by the state engineer recently of a water permit to the State Light and Power Company to generate hydro electric power at White Rock Canyon in the Rio Grande, 45 miles north of Santa Fe.

State Engineer James A. French spent some time recently at the Rio Mimbres irrigation plant near Deming, looking over the company's reclamation work.

The rains of the past few days are excellent arguments in favor of irrigation in San Miguel county, New Mexico. The river is running bank full and is pouring water into Lake Isabelle, one of the big reservoirs on the J. D. Hand project.

The La Plata Land and Irrigation Company was sold at Aztec, New Mexico, recently by Henry Van Schaack, trustee in bankruptcy. The purchasers were represented by W. C. Henry of Denver, and Attorney Arthur Ponsford appeared for the lien claimants. The land sold embraces 7,000 acres located in La Plata precinct.

Robert L. Cooper, civil engineer, was recently at Lake Sharette, near Springfield, New Mexico, to look over the proposed irrigation project to be put in there under the Carey act.

MONTANA

The *St. Ignatius Post* explains a threatened cave-in at the North Pablo Dam of the reclamation project located near Polson as follows: "Large cavities in the bottom of the North Pablo dam occurred last week, according to reports from reclama-

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tion headquarters. In several places in the dam large areas of ground fell in, with the result that a large amount of water in the dam has disappeared. No explanation of the matter can be given."

Governor Stewart of Montana has recently been in Washington, accompanied by a strong delegation of leading citizens to protest against withdrawing any of the money which has been set aside for Montana projects and placing it elsewhere.

State Engineer A. W. Mahon of Montana received word from the Department of the Interior that the Little Missouri project, comprising 21,000 acres of Carey land, had been approved.

The Carey Land Act Board recently executed a contract for the reclamation and settlement of the second unit of the Valier project, embracing 25,000 acres. It is estimated that this unit will support over 300 families.

People who own land in the Helena Valley now have an opportunity to make contracts with the Montana Reservoir and Irrigation Company to supply their lands with water for 30 years at a cost of \$1.75 per acre per annum.

Prominent business men of Roundup, Montana, are interested in an irrigation project in Musselshell county, which project is unique in that it contemplates the use of a reservoir site dug by nature ages ago. If the plan is carried out it will bring many thousands of acres under ditch in the valley of the Musselshell between Ryegate and Melstone.

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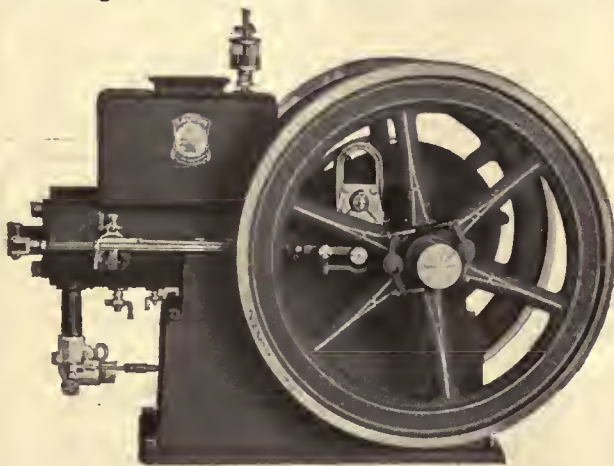
UTAH.

A gratifying response to the request of the State Reclamation Company of Utah for 10,000 subscribers to the fund to reclaim the waste land lying between the Jordan river and the Great Salt lake, is reported by O. L. Gibelee, the secretary of the company. Mr. Gibelee states that the public

(Continued on page 293.)

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Sworn to and subscribed before me this 1st day of July, 1913.

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Table of Natural Tangents and Cotangents.
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Table of sizes of pipes or cylindrical conduits required for the flow of given quantities of water at given velocities.

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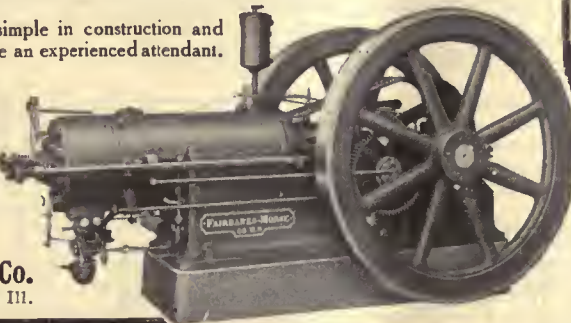
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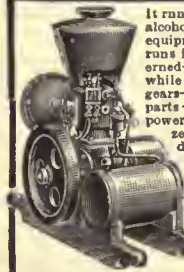
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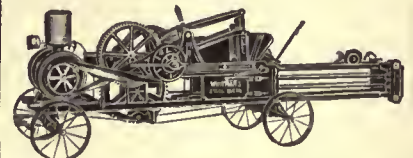
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Every piece of wood used in I H C wagons is carefully selected and air-dried. Only in air-dried lumber does wood retain its full strength and elasticity. All steel or iron is selected with the same care to secure the greatest possible strength. Thorough knowledge of the strain each part must stand is necessary because a wagon, like a chain, is no stronger than its weakest part. Every part of I H C wagons

Weber New Bettendorf Columbus Steel King

has the same relative strength. The men who build I H C wagons know why one part is built stronger than another, know the exact strain it will have to bear. This same thorough knowledge has enabled them to build a wagon of light draft, which puts the least strain on the horses, without impairing the durability of the wagon.



The finishing touch, the thing that adds to the life and appearance of an I H C wagon, is pure paint. Cheap paint may improve the appearance of a wagon for a short time, but after that is a positive detriment. Only pure paint is used on I H C wagons. It fills the pores of the wood, prevents shrinking, swelling, warping and twisting, and acts as a wood preservative.

There are many other reasons why I H C wagons are such good wagons. Weber and Columbus wagons have wood gears; New Bettendorf and Steel King have steel gears. Get catalogues from the I H C local dealer, or, write the nearest branch house.

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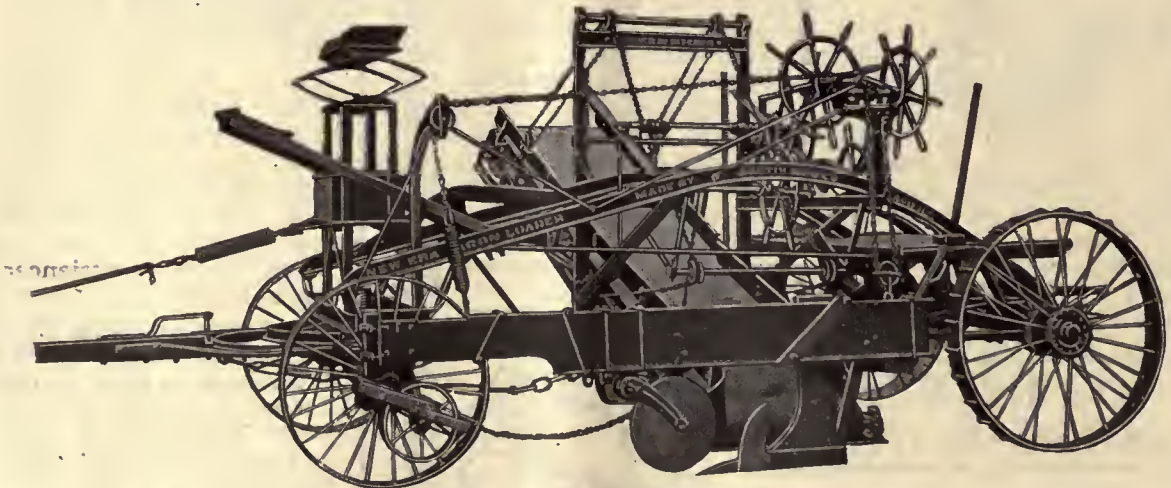
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For over fifty years the leader and pioneer for economical earth handling, has advanced still higher in the estimation of practical earth handling contractors by its recent improvements.

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2. The Austin roller bearing disc plow.
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An Institution for

THE HIGHER EDUCATION OF YOUNG WOMEN

THE SITE OF THIS INSTITUTION is an ideal one, affording the climatic advantages of an altitude some hundred feet higher than that of the surrounding country, and combining natural beauties and salutary quiet with all the charms of suburban life.

BOATING, HORSEBACK RIDING, SWIMMING, ARCHERY, GOLF and all outdoor athletics for girls under the constant supervision of a graduate of the Sargent School for Physical Education. School course comprises INTERMEDIATE, ACADEMIC and COLLEGIATE departments. Special courses in MUSIC, ART, LANGUAGES, DOMESTIC SCIENCE and DRAMATIC ART.

THE BUILDINGS are furnished with all modern improvements in heat, light, and ventilation, and are abundantly equipped with the most approved sanitary appointments.

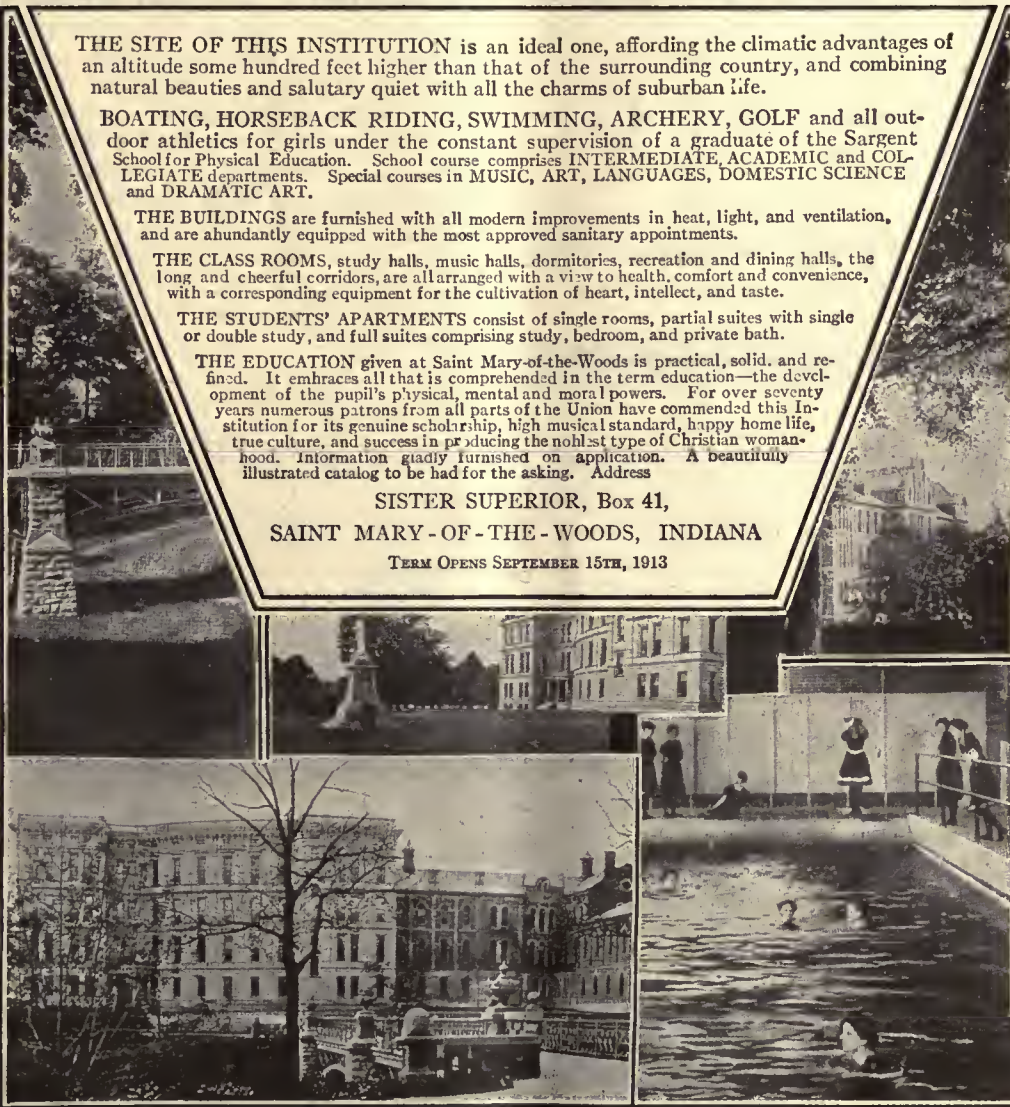
THE CLASS ROOMS, study halls, music halls, dormitories, recreation and dining halls, the long and cheerful corridors, are all arranged with a view to health, comfort and convenience, with a corresponding equipment for the cultivation of heart, intellect, and taste.

THE STUDENTS' APARTMENTS consist of single rooms, partial suites with single or double study, and full suites comprising study, bedroom, and private bath.

THE EDUCATION given at Saint Mary-of-the-Woods is practical, solid, and refined. It embraces all that is comprehended in the term education—the development of the pupil's physical, mental and moral powers. For over seventy years numerous patrons from all parts of the Union have commended this Institution for its genuine scholarship, high musical standard, happy home life, true culture, and success in producing the noblest type of Christian womanhood. Information gladly furnished on application. A beautifully illustrated catalog to be had for the asking. Address

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TERM OPENS SEPTEMBER 15TH, 1913



THE WINNER



THE machine that leads all eighth yard mixers for design, principle, cost of operation, convenience of operation, thorough of mix and low price. Get our catalog and learn *Why*.

The Cement Tile Machinery Co.

175 Rath Street,

WATERLOO, IOWA

(Continued from page 279.)

United States have invested \$75,000,000 in building irrigation works to irrigate farms; not to raise the values of lands held out from use. The man who chooses to hold his land from use has a right to speculate upon his own resources, but not upon the advance loan of the Government. I think that conditions fully justify special consideration being given to those farmers who have gone upon these reclaimed lands and done their best to cultivate them. The notice given today is an act of leniency toward a debtor who is in difficulties. It should be said in justice to the water users that at the recent hearing not one of them even suggested a desire that the Government should waive its debt; all said that they were prepared to meet their obligations to the Government if terms somewhat more favorable were given. Less than one-half of the water users have paid the building charges which were due December 1, 1912, and which will be delinquent December 1, 1913. At this time it becomes necessary to insist upon payment of operation and maintenance charges, which should have been paid last spring and were deferred owing to the pendency of the Swigart vs. Baker case in the courts in which the right of the Government to collect such charges has now been upheld. In view of all of these conditions it seems a wise and just thing to reduce all present building payments, giving credit to those who have paid."

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Situated on Georgian Bay, about 3 miles from Owen Sound, Ontario, Canada. Is exclusively a *Summer Resort*, open from July 1st. till September, with accomodation for 250 guests.

Commodious steamboat makes direct connection between the Grand Trunk and Canadian Pacific Railway trains at Owen Sound and the hotel. Also makes connections with all passenger boats running from Owen Sound to Sault Ste. Marie, Mackinaw, Chicago, Duluth, Fort William, etc. Connections can be made at the Soo for boats to Detroit, Cleveland and Buffalo. Two mails daily, long distance phone, golf, bowling, tennis, bathing, motor boating and motoring.



Rates from \$2.50 per day and \$14.00 per week up. For reservations and further particulars apply to

THE KING'S ROYAL HOTEL AND PARK COMPANY

OWEN SOUND, CANADA



WILLIAM GALL, Manager

ALEX. H. S. RITCHIE, Assistant Manager

When writing to advertisers please mention The Irrigation Age.

(Continued from page 288.)

fully realizes the fact that the enterprise is a public one, and not one designed for the profit of a few, and a substantial response in the way of stock subscriptions is coming in.

Railway officials report agricultural conditions excellent in southern Utah. The assistant general freight and passenger agent for the Salt Lake Railroad, Mr. Manderfield, and Louis A. Merrill, agricultural expert for the company, returned recently from an inspection tour of the irrigation projects in Washington, Iron and Beaver counties. They report promising conditions and a general air of prosperity among the farmers.

Two big water projects near Lehi, Idaho, were carried to fruition this week. For some time the Provo River Reservoir Canal from Provo River to the highlands north of Lehi has been completed, and this week the company completed the big flume which will carry the water across Dry Creek. This syphon is 1,064 feet, with an additional 100 feet on either end constructed of cement. It is 4 feet 1 inch in diameter, and when necessary will carry 200 second feet of water for 80 irrigation streams.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.



The field is unlimited and uncrowded; marketing the product in competition with the clay interests and at clay tile prices produces a great profit and a glance at the future spells only success for the factory or business started today.

No existing proposition offers such flattering inducements or such a field of opportunity for the man looking for a vocation or for the man looking for an investment. No other business can net you such profits on the amount of capital involved, and no other business has such an unlimited future.

Just think of a business paying from 30% to 50% on the investment the very first season, and subsequently from 50% to 150%, then ask yourself the question—Is it worthy of investigation?

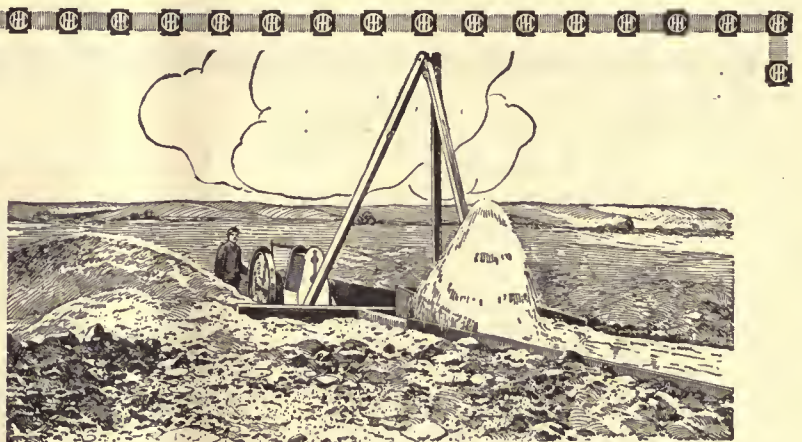
Our literature gives you all the details regarding the merits of cement tile, the cost of manufacture, the amount of capital required to embark in the business; how to build your factory and last, but not least, it tells you how we aid the manufacturer using our machinery and gives you our full and complete proposition. A short letter telling that you are interested will bring complete data.

The Cement Tile Machinery CO.

172 Rath St., Waterloo, Iowa.

An Independent Irrigating System Is the Best

INDEPENDENT irrigating systems, when properly operated, prove true to their title—they make you independent of rain or other uncertain sources of supply. Almost without exception they prove the cheapest and most satisfactory. If you are able to secure a sufficient supply of water by sinking wells, or from a lake or stream, you should start today to lay out a good irrigating system. Dependable power is easy to obtain. An



I H C Oil and Gas Engine

will take care of the pumping and will also furnish power to run any farm machine. It will require no watching except to keep it properly oiled. It is the cheapest and most dependable power you can secure.

I H C engines are built in many styles—vertical, horizontal, portable, skidded, air-cooled, water-cooled; in sizes from 1 to 50-horse power. They operate on gas, gasoline, naphtha, kerosene, distillate, alcohol.

I H C tractors are built in sizes from 12 to 60-horse power. There are also spraying, pumping, hay baling, wood-sawing, outfits, etc.

WESTERN BRANCH HOUSES: Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

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Get our interesting irrigation catalogue from the I H C local dealer, or, write the nearest branch house for a copy.

Irrigation **KT** Systems

Earth Ditches are Costly and Wasteful
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Concrete Flumes are Perishable and Obstructive

All Three Waste Water—Time, Money, Land and Labor

In its day each of the above methods served a purpose, but each was too wasteful and expensive to prove permanent. This made necessary the development of the "K T"—a System whose success has been so universal as to practically revolutionize irrigation methods throughout the Southwest. The "K T" is Efficient, Economical, Permanent. Once installed, your Irrigation Troubles will be overcome forever.

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Use KEROSENE Engine Free!

Amazing "DETROIT" Kerosene Engine shipped on 15 days' FREE Trial, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing. No waste, no evaporation, no explosion from coal oil.

Gasoline Going Up!

Gasoline is 9c to 15c higher than coal oil. Still going up. Two pints of coal oil do work of three pints gasoline.

Amazing "DETROIT"

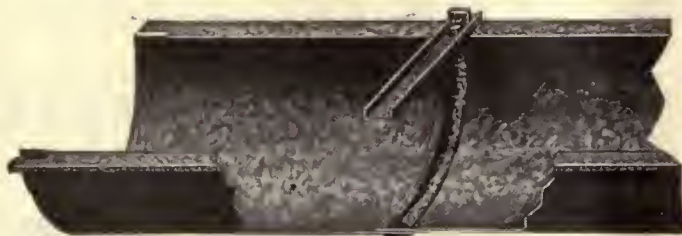
—only engine running on coal oil successfully, uses alcohol, gasoline and benzine, too. Starts without cranking. Only three moving parts—no cams—no sprockets—no gears—no valves—the utmost in simplicity, power and strength. Mounted on skids. All sizes, 2 to 20 h. p., in stock ready to ship. Engine tested before crating. Comes all ready to run. Pumps, saws, threshes, churns, separates milk, grinds feed, shells corn, runs home electric lighting plant. Prices (stripped), \$29.50 up. Sent any place on 15 days' Free Trial. Don't buy an engine till you investigate the money-saving, power-saving "DETROIT." Thousands in use. Costs only postal to find out. If you are first in your neighborhood to write, you get Special Extra-Low Introductory price. Write! (138)

Detroit Engine Works, 301 Bellevue Ave., Detroit, Mich.



GALVANIZED METAL IRRIGATION FLUME (Newcomb Patent)

Made entirely of rust-proof, galvanized iron. No bolts or rivets used in construction. This flume is



Section of Flume

considered by experts to be the most serviceable equipment for the purpose on the market. A careful examination of the construction as shown herewith will convince those who are acquainted with irrigation conditions of its lasting quality and the ease with which it may be put together. Complete information, with prices, will be furnished on application to the

KLAUER MFG. COMPANY, Dubuque, Iowa

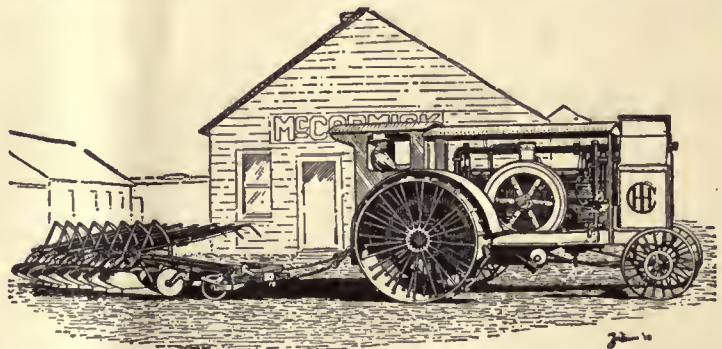
Make Your Work Count

WHEN you start your spring work this season—plowing, harrowing, rolling, seeding, etc.,—you can make your work easier, do it faster and better, and save money besides by putting an I H C tractor on the job. If your farm is small, buy a small tractor, 12, 15, 20, or perhaps 25-horse power; if large you can use a 25, 30, 45, or 60-horse power machine to advantage. An I H C tractor makes your work count. With it you can plow from two to ten times as much ground in the same time as with a horse plow. You can plow, harrow and roll at the same operation; you can draw two to four drills; at harvest time you can use it to draw the binders. It saves time and money in every operation. Make your work count.

Buy An I H C Oil Tractor

Besides doing the other work at a saving, you can use it also for threshing, grinding, road making, irrigating, or any other belt power and draw bar work to which it is adapted. When used for all the work that it will do, the I H C tractor is one of the handiest machines, also one of the most economical, that you can have on your farm.

I H C tractors are made in all styles, and in 12, 15, 20, 25, 30, 45, and 60-horse power sizes. They operate on low or high grade fuel oils.



I H C general purpose oil and gas engines, which can be used to run any farm machine to which power can be applied, are made in 1 to 50-horse power sizes. These engines furnish the steady power required for use in shop, mill and factory. They operate on gas, gasoline, naphtha, kerosene, distillate, or alcohol.

The I H C local dealer will give you catalogues of I H C tractors and engines, and will give you full information about the whole line, or you can secure it by writing the nearest branch house.

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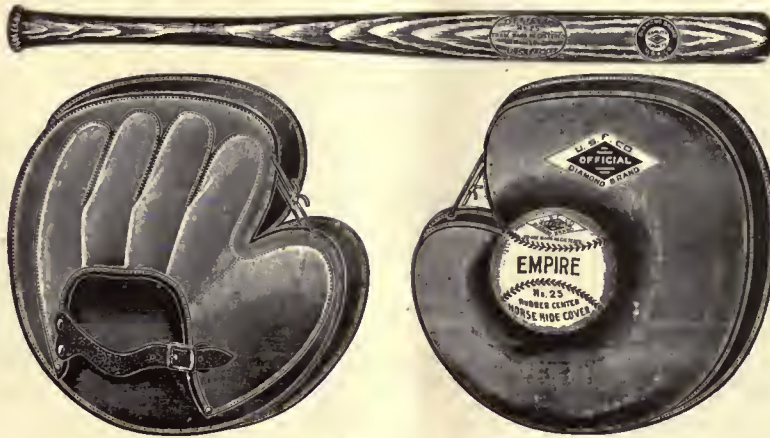


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Send for Sample Copies and Subscription Blanks, with Letter from us authorizing you to act as our Agent

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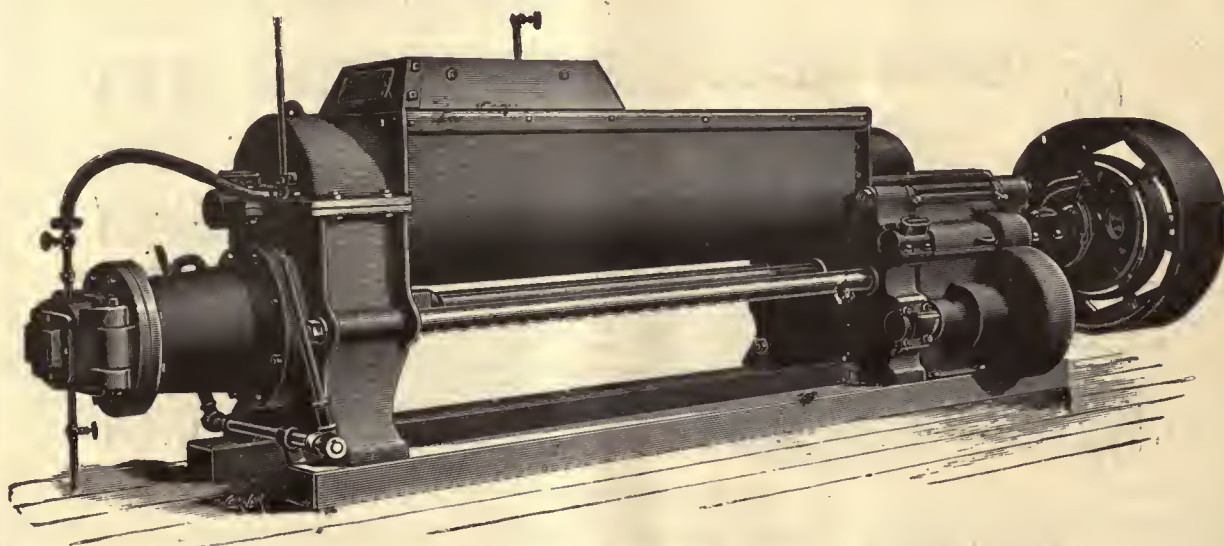
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Outfits for Drain Tile, Hollow Ware, Building
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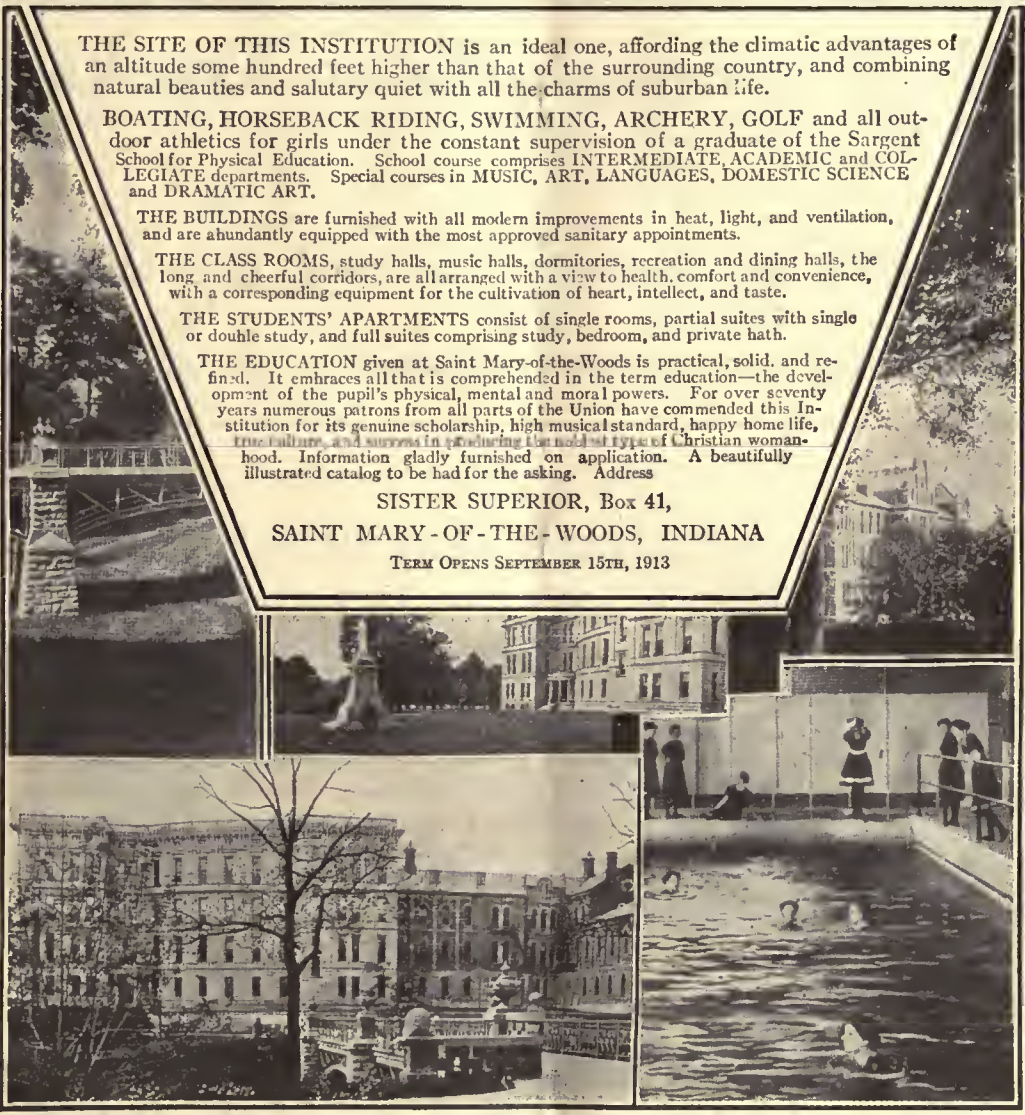
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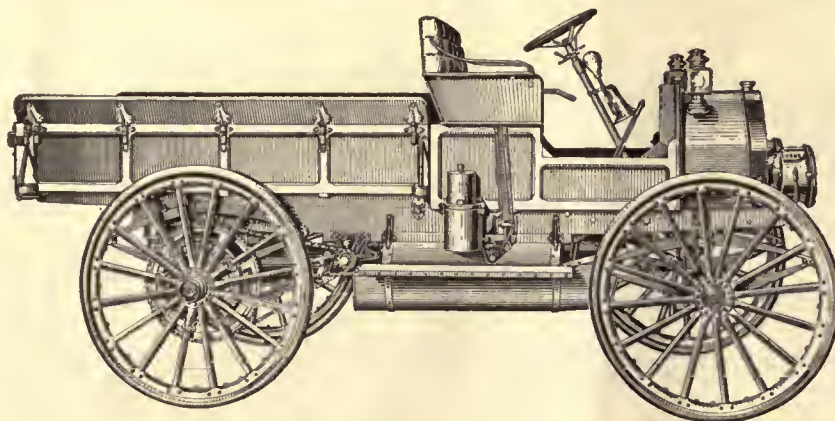
THE CLASS ROOMS, study halls, music halls, dormitories, recreation and dining halls, the long and cheerful corridors, are all arranged with a view to health, comfort and convenience, with a corresponding equipment for the cultivation of heart, intellect, and taste.

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If your business is one that demands prompt deliveries, or requires a great deal of light hauling, you can use an International Motor Truck, perhaps more than one, and save money by its use.

With seven years of experience to teach us, we have developed this truck along the lines of greatest usefulness and closest economy for the use of business men in city and country. The improvements made have all been dictated by experience and they have all been of the kind technically known as refinements. The 1913 model is an efficient business wagon, just what you need to put your delivery service on the most up-to-date and economical basis.

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are furnished with any style of body desired. Our agents are instructed to see that your driver thoroughly understands the car before he takes charge. A repair part service is maintained at each of our general agencies, located in nearly a hundred of the principal cities of the country, protecting you from delays caused by unavoidable accidents. You are safe in buying an International Motor Truck. It saves money and it makes money for the man who can use it.

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International Harvester Company of America

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The publisher of Irrigation Age has recently purchased the National Land and Irrigation Journal of Chicago and the Irrigator of North Yakima, Wash., and their combined circulation has been merged with that of the Age.

One Dollar Per Year

Irrigation Age

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Larger Sizes in Proportion

**"Buffalo" Vertical Suction
Centrifugal Pump—the highest
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We are prepared to make stock shipments from factory of this highly recommended and exceedingly popular irrigation pump, used for heads not exceeding over 50 feet. It belongs to the trade-marked "Buffalo" Class M family, which has won just recognition as the highest value obtainable in popular priced centrifugal pumps. The outfit includes pump, pulley, companion flanges and coupling for both suction and discharge, as shown. Only the finest white babbitt metal is used in the extra long bearings, which are furnished with brass compression grease cups. Thrust bearing is of ball bearing type. It may be installed by attaching the suction flange directly to the well casing, the pump itself being set between two vertical timbers, which also carry the shafting, bearings, etc., and is driven by pulley located above the ground at top of the well. Bearings, shaft collars, and steel shafting can be supplied at a slight extra cost to suit your individual requirements. Being accurately made and fitted, all parts of the pump are interchangeable and can be promptly duplicated at any time. Couplings are bored same size as shaft and bearings. Larger sizes also made. The price quoted is f. o. b. our factory.

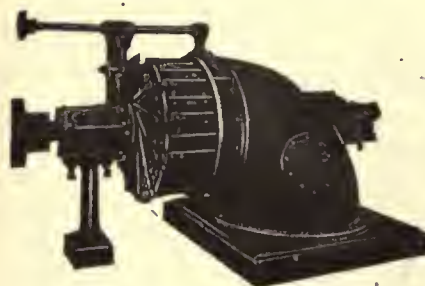
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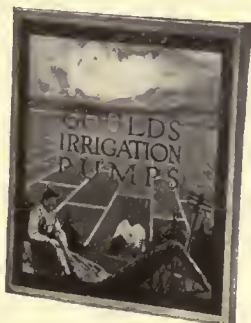
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If you have an irrigation problem to solve, do not fail to write for full information concerning this Combined Grader and Irrigation Ditcher.

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It also shows all of the various types of pumps to meet the conditions found in different localities, tells how to select the proper pump for your conditions, how to determine the amount of power you

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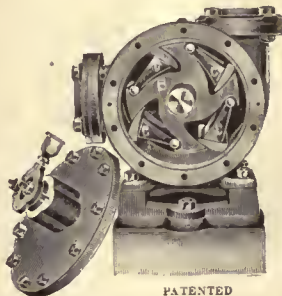
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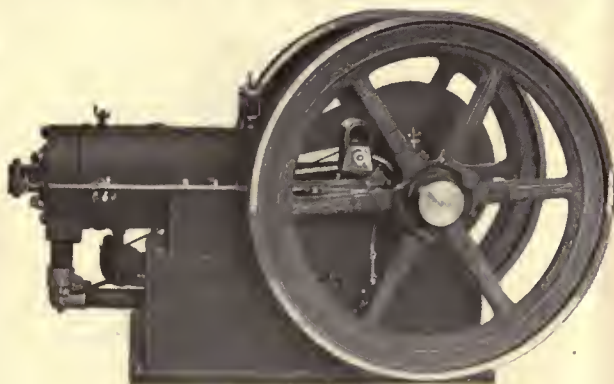
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Tell us about your pumping problems.

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This Engine Has Given Satisfaction Wherever Used



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Twenty-Eighth Year

THE IRRIGATION AGE

VOL. XXVIII

CHICAGO, AUGUST, 1913.

No. 10

THE IRRIGATION AGE

With which is Merged

The National Land and Irrigation Journal

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD
THE IRRIGATOR

D. H. ANDERSON
PUBLISHER,

30 No. Dearborn Street, CHICAGO
Old No. 112 Dearborn St.

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D. H. ANDERSON, Editor

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for
Settlers

In this issue appears a communication from the pen of Mr. Edward Bohm, of Cleveland, Ohio, member executive Congressional committee of the National Irrigation Congress, that is of sufficient interest to attract the attention of every one who has the welfare of the west at heart. Mr. Bohm made a general western trip about a year ago and devoted much time to the study of various plans under which irrigation is carried on throughout the west. While on this trip, which was taken in the interest of this publication, he made a careful study of abuses committed under the Carey Act; this was of particular interest to him, as study in the preparation of his work, "The Carey Act," had given him a clear insight to the possible abuses that were likely to develop under that law. Mr. Bohm was especially severe in his criticism of the manner in which projects like "The Big Lost River," and several others, were handled in Idaho.

It is therefore our opinion that our readers generally will go carefully over his letter appearing in these columns.

International
Harvester
Loses Good
Man

Mr. M. R. D. Owings, who for the past eight years, has been in charge of the advertising and publicity departments and service bureau of the International Harvester Company, has in the reorganization of the executive staff of M. Rumely Co., La Porte, Ind., been honored by his election as director and vice-president of that institution. Mr. Owings has had an extended experience in the implement business. He began with the Sandwich Manufacturing Company and later entered the employ of the Milwaukee Harvester Company at Milwaukee, subsequently becoming the head of the departments specified, shortly after the organization of the International Harvester Company.

The advancement of Mr. Owings is an illustration of the possibilities for a man who carefully and heartily enters into the study and requirements of a large and growing business. He is a man of unusually keen perception and has mastered each and all of the difficulties arising in the development of the various departments over which his jurisdiction extended. His many friends throughout the newspaper world will wish him the very best success in this new position.

Water Resources of Hawaii

We are presenting in this issue a number of fine half-tones showing the water resources of Hawaii, which were secured through the United States Geological Survey of the Department of the Interior.

These illustrations were first used in Water Supply Paper 318, prepared under the direction of M. G. Leighton by W. F. Martin and C. H. Pierce.

This volume contains results of measurements of the flow of certain streams and ditches in the territory of Hawaii made during the period 1909-1911, and presents an account of the factors that affect the flow and a summary of the general conditions influencing the economic development and use of the surface waters.

National Forest Service News

The Forest Bureau of the United States Department of Agriculture has evidently secured the services of someone of more than ordinary ability, to handle its publicity service, as the matter received from that

source has improved wonderfully during the past six months.

Another feature of this class of news, which is gratifying to those who have perused it regularly for any considerable time, is the fact that we are not continually confronted with the name, or have forced upon us, the personality of the director, as was the case during the days when Gifford Pinchot was the ruling spirit, and as he often expressed it, was "President Roosevelt's errand boy." Much more publicity will be given forestry news under the present system of handling it.

Express Companies and Parcel Post

In a recent communication from a correspondent at Washington is secured the first tangible information of a direct effort of the Express companies to destroy the Parcel Post. Our correspondent states that

should the "administrative powers" clause of the Parcel Post be stricken out the vital force of that law will be killed and there would then be no possibility of expansion and the work of 40 years will be lost.

This is a sad outlook and every farmer and ranchman throughout the western country should wake up and send letters and telegrams to the U. S. senators from each State, as well as to the congressman from their district. They should also write to the postmaster general at Washington urging that the Parcel Post law be let alone and that every effort be made to extend it.

It is extremely important that our readers should act in this matter at once as the strongest money forces in the country are at work to kill or so cripple this beneficent law as to make it of little value. Act now.

Working to Educate Dairymen

The Department of Agriculture has issued a statement outlining its policy in dealing with the milk situation in the United States, in which it is pointed out that it is erroneously supposed that the department has established absolute standards and bacterial counts to which all milk, coming under its jurisdiction in interstate commerce, must comply.

The Department in its milk activities is carrying on an extensive campaign of education to help dairymen produce and market good milk. This work is carried on principally by the dairy division of the Bureau of Animal Industry.

This bureau issues many educational bulletins based upon its experiments in the economical production of clean milk. It supplies farmers with these bulletins and also sends men into the field to show milk producers how to make changes within their means which will raise the quality of their milk and increase their profits. When indications are found that the milk is not properly produced, and is likely to become dangerous, the dairyman is warned to clean up and is shown how to improve his milk.

This, it may readily be seen, tends to better conditions all around and work of this character should be encouraged by the milk producers throughout the country. Any move that leads to better health conditions should be supported by all.

American Foresters Help Palestine

An agricultural colony in Palestine has just applied to the U. S. forest service for help in planting trees to bind the drifting sands of the Mediterranean. The colony is near Jaffa, or Yafa, the ancient Joppa of the

Bible, and there is being developed in connection with it a seaside resort, with hotel, villas, bath houses and gardens.

The experts of the service point out that the reclamation of sand dunes is not a serious problem in the eastern United States because the prevailing winds are from the land and the sand is blown into the sea. On the west coast the situation is more serious. The most notable example of reclaimed sand areas there is furnished by Golden Gate Park, San Francisco, where grasses, acacias, and, later,

trees and shrubs have converted sand wastes into pleasure grounds of great beauty.

The attention of the Palestine colony is called to the wonderful reclamation of the Landes, France, where a wealth-producing forest of maritime pine, the source of the French turpentine, has been grown to take the place of shifting dunes.

The American foresters also give the address of the French seedsman who furnished this government with the maritime pine seed which has been used in planting experiments on the Florida national forest, near the Gulf coast.

**Idaho
Settlers
Sympathize
With Kuhns**

In many parts of southern Idaho, notably the cities and village centers, the people have met and adopted resolutions of sympathy with the Kuhn brothers, of Pittsburgh, Pa., in their financial troubles. This action speaks loudly in behalf of the honesty with which the work of irrigation in that part of the country has been conducted. Settlers under the Carey Act in the Twin Falls region of Idaho realize that they are fully protected. The Kuhns have been unfortunate in their banking enterprises, but wonderfully successful in their irrigation ventures. It is well understood that these latter are not affected in any particular by the assignment; that the settlers who have bought water rights will get, and are getting, what they pay for, and that the bankruptcy (if it be bankruptcy) of the enterprising men who constructed the great works will not affect them.

It would be well for the cause of irrigation if a similar statement could truthfully be made of other failures, but unfortunately it cannot. All told, the Kuhns have constructed irrigation and power plants to the value of something like \$18,000,000 in southern Idaho. They have safeguarded this mammoth investment so well that they are not only safe themselves on this particular investment, but the people who have been induced to invest their money there in farms, orchards, and business, are also safe.

All the bonds and other securities issued against these irrigation plants were put out by the American Waterworks Company, not by the Kuhns. It is true that a receiver was appointed for this company on the voluntary petition of the directors, but it was merely a move to head off such ill-advised, hasty action as might be precipitated by those unacquainted with the real conditions. The receiver is about to be dismissed, the courts holding that the company is an independent concern and perfectly solvent. It could not well be otherwise. The money paid in by purchasers of water rights constitutes a trust fund which goes to retire the securities, and is amply sufficient to meet all obligations.

It is not often that a community, or aggregation of communities, will express sympathy with the principals in a mammoth failure. That the people of Idaho have done so in no uncertain words is evidence that the settlers are well convinced that they have been treated fairly, their rights have been amply protected, and that the Kuhns and the other gentlemen associated with them have done a wonderfully beneficial work for Idaho and the entire West. It is too bad that the fortune of business has been such as to accomplish the financial downfall of the Pittsburgh bankers, but they can have the satisfaction of knowing that it was not caused by their work in irrigation development. In this latter line they have builded an empire, and it has brought a just reward.

**Convert
to
Supplemental
Irrigation**

Edwin Yaggy, one of the extensive and successful orcharders in Kansas, is a firm believer in supplemental irrigation. He says that in that section of the country there comes a time nearly every year, perhaps only lasting a few days, when if the ground could have water good crops would be assured. Mr. Yaggy states that one year recently he had a crop of 50,000 bushels of apples, but believes that if he had been fixed to irrigate his orchard at the critical time the crop would have exceeded 100,000 bushels. By reason of the lack of water at that particular time the apples were undersized and very materially cut down in quantity, so the loss came from two directions. In speaking of irrigation, Mr. Yaggy says that the most practical work along that line is being done at the state reformatory grounds and on the grounds around public institutions in Kansas. He has learned a lesson that the IRRIGATION AGE has been trying to teach for many years, namely, that of a supplemental irrigation plant, which if established on a 40-acre tract and properly worked out, would, during the ordinary dry spell, bring the other three-quarters of a quarter section farm up to a normal crop for the entire 160 acres. In other words, if, during the inevitable dry spell, a man is able to properly irrigate one-quarter of his tract, say ten acres out of an estimated holding of 40 acres, and can make the ten acres which is irrigated produce four times what it would if left without water, he is holding up to a normal average for his entire 40 acres or what could be obtained during a favorable season when moisture conditions are right. Every farmer in the United States who has the means could well afford to try the experiment of irrigating during each season's dry spell, at least 10 acres, and by comparing the products of this 10 acres with any other 10 acres in his tract would

very soon be convinced of the advantage of a general supplemental irrigation system to cover his entire holdings. At the present price of windmills, pumping engines, tanks, and a knowledge of the cost of building a reservoir on the highest point of his land, no farmer should hesitate to try out supplemental irrigation.

The fact that the office of experiment stations of the United States Department of Agriculture has not taken up this subject has always been a cause of wonderment in the mind of the editor of this journal. There is an actual loss on every form in the humid and semi-arid regions of from 20 to 30 per cent, due to what is known as our "dry spell" in the growing season.

Mr. Yaggy is evidently a progressive farmer who has studied this out carefully and we trust that the results of his work may be published broadcast so that other farmers throughout the country may be encouraged to adopt this system.

**'Tis an Ill
Wind That
Blows No
Good**

Damage to crops is always a misfortune to the world at large. Advices from the corn belt report that long-continued lack of rain and unusually hot spells of long duration have worked havoc with the growing crop. Such reports must always, of course, be discounted to some extent, as the excitement invariably leads to a certain amount of exaggeration. In this case, however, there is strong reason to fear that the damage is very nearly, if not fully, as bad as stated.

There is a reflection of this in the Chicago grain market. Speculators take pains to be unusually well informed as to crop conditions and movement. Corn is now bullish. Prices are advancing by jumps. So are the values of other grains. Receipts are falling off, farmers who are acquainted with the situation evidently preferring to hold cereals back. They are acquainted with the conditions and believe the damage is so great and widespread that still higher prices must result.

At the same time reports from irrigated territory where the farmers are not dependent upon rainfall, show that all crops are in magnificent condition. The promise for bumper harvests was never equaled. While the drought in the non-irrigated area has tended to advance prices sharply, the men who farm irrigated lands are in position to take advantage of the situation. They will have immense quantities of produce to sell and will get big prices for it. This, it is true, is at the expense of those less fortunate, but in it may be found a forceful illustration of the benefits of irrigation. It makes the tiller of the soil independent of climatic conditions.

**Credit
to Whom
Credit
Is Due**

In discussing the wonderful work of development that has been accomplished in southern Idaho, a work of veritable empire building, there are two men who should not be overlooked. These men are I. B. Perrine, of Blue Lakes, Idaho, and H. L. Hollister, of Chicago. They were the first to recognize the possibilities of the country, provided water could be procured for crop-growing purposes. But this took money, lots of it, and neither of them was wealthy enough in the way of actual cash to undertake an enterprise of such magnitude. But they were both hustlers, and their ability to hustle in a good cause filled the bill.

Mr. Perrine, a farmer, was naturally interested from the viewpoint of a farmer. He realized the crop-producing possibilities. Mr. Hollister, on the other hand, a city man, saw the manifold advantages in the line of water power which the construction of irrigation plants would produce. They joined hands and interested capital, with the result that a marvelously complete system of irrigation was introduced. It will stand for ages as a monument to their enterprise.

Neither man had any special advantages for the work in which they embarked, beyond the possession of an inexhaustible fund of common sense, honesty of purpose, and a determination to succeed in whatever they undertook. They went over the ground carefully, decided their plans were feasible, and then went out to win. And win they did. The securing of capital was no easy task. It took years of hard work. Most men would have become discouraged, but Messrs. Perrine and Hollister never faltered. More long years passed before the tract was in such shape that lands could be safely sold, but at last that day arrived, and the rest was easy.

To Mr. Perrine should be given the larger part of the credit for the intelligent direction of the work on the ground. He knew what the land was capable of, and how to secure the best results, whether from farm or orchard. Mr. Hollister is the man who knew how to bring the country to the attention of the public in the most effective manner, secure the necessary volume of sales, and at the same time make sure of getting a desirable class of settlers. That both were unusually successful the Twin Falls country gives proof. In this important work THE IRRIGATION AGE may modestly claim to have taken an essential part. It will be glad to do so again should Messrs. Perrine and Hollister undertake a similar project.

Messrs. Perrine and Hollister have recently concluded an extended tour of the Twin Falls country on which they acted as guides to a large party

of business men, mainly bankers, whom it is desired to interest in similar works of irrigation. Without exception these men, many of whom are well versed on this subject, have expressed themselves as astounded by the magnitude of the work, the substantial manner in which it has been conducted, and the prosperity of the country. One man writes: "I thought I knew all there was to know about irrigation, but this trip has been an eye-opener. It has been a revelation. I never saw such a country, and did not think it possible for one to exist."

STATES GET A THIRD OF FOREST SERVICE RECEIPTS.

A circular just issued by the forest service calls attention to the various laws under which more than a third of all national forest receipts go to the benefit of the states in which the forest are situated, for schools and roads. In 1912 the amount of money thus made available for state purposes totaled about \$750,000. The report does not show the amounts due from the receipts of the fiscal year which closed June 30, 1913. Including these, the states' share of national forest funds since the laws were passed has aggregated over \$3,000,000.

These facts are set forth, according to the forest service, because a popular impression still exists that all money received by the government from timber sales, grazing fees, water power permits, etc., is permanently taken out of the states where it is paid and goes into the national treasury to meet the general expenses of the government. This idea is said to prevail, to some extent, even among actual forest users in the national forest states, where the division of receipts with the states has been going on for years.

The circular states that part of the gross receipts of the national forests was first made available for schools and roads when the agricultural appropriation act of June 30, 1906, directed the Secretary of the Treasury to pay over to the state or territory in which any forest reserve was situated 10 per cent of all money received during the fiscal year from such reserve. The money was to be expended by the state or territorial legislature for the benefit of public schools and roads in the counties in which the forest reserve lay. This legislation was recommended by the forest service because of the recognized burden imposed locally where national forests operate to prevent much land from becoming taxable.

In 1908 the amount to be paid to the states was increased to 25 per cent, and a proviso of the earlier act that no more should be paid to a county than 40 per cent of its total income from other sources was eliminated. Since this proviso was removed, some of the counties' receipts from national forest lands have equalled their income from all other sources.

In August, 1912, the agricultural appropriation act for the year made available an additional 10 per cent of the money received from national forests to build and maintain roads and trails within national

forests for the benefit of the public, in the states from which these proceeds are derived. This 10 per cent "road item," as it is called, is expended by the Secretary of Agriculture, who may, according to the act, "whenever practicable in the construction and maintenance of such roads, secure the co-operation or aid of the proper state or territorial authorities in the furtherance of any system of highways of which such roads may be made a part." The total amount expended under this provision from the receipts of the fiscal year 1912 is \$207,295. This was apportioned among the states as follows: Alaska \$4,675, Arizona \$24,645, Arkansas \$2,283, California \$24,821, Colorado \$21,503, Florida, \$981, Idaho \$23,809, Kansas \$489, Michigan \$2, Minnesota \$503, Montana \$23,926, Nebraska \$1,630, Nevada \$6,034, New Mexico \$11,850, North Dakota \$28, Oklahoma \$351, Oregon \$17,023, South Dakota \$4,226, Utah \$13,504, Washington \$12,758, Wyoming \$12,254.

SHEEP GO FOUR MONTHS WITHOUT WATER.

Sheep in the Nebo National Forest, Utah, go four and a half months without water except for such moisture as they get from the dew and the juices of forage plants.

Grazing sheep on a range entirely destitute of water is a recent innovation due to the increasing demand for forage and the efforts of the forest officers to find a place on the forest ranges for all the stock that can safely be admitted. The area on the Nebo which has now proved usable by sheep is high and rocky, a portion of it being above timber line, and it has neither springs nor streams of sufficient size or accessibility to be used for stock watering purposes. The grazing season lasts from June 15 to October 31, and during this period of four and a half months the animals do not get a drink.

Under such conditions, however, the sheep have done extremely well, and last year's lambs from this range had an average weight at the close of the season of 68 pounds on the Chicago market, which was rather above the normal weight from that vicinity.

In one area on the Targhee forest in Idaho sheep get water only twice during the four-months summer grazing season. There is no water on the range, but the sheep are driven to a nearby stream lower down the mountain side. Lambs from this range weighed 65 pounds on the Chicago market.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of THE PRIMER OF HYDRAULICS add \$2.50 to above price.

IDAHO, THE MODERN WONDERLAND

By W. J. Jackman.

Away out on the prairies of Idaho, 1,700 miles northwest of Chicago, where seven years ago there were few signs of civilization and, as far as the eye could reach, nothing could be seen except wide stretches of sagebrush, and the principal inhabitants were roving Indians and jackrabbits, there is being constructed an electric railway which, in many respects it is asserted, will be one of the most perfect in the country. This road, which is only 12 miles in length, will cost, including equipment, about \$250,000. Virtually all of this money will be expended for rails and cars. The work of grading the roadbed is very light and the expense small. The country is practically level, without cuts or fills of any account, while the steepest grade is not over 3 per cent. Strictly speaking the line is only six miles in length, but, as it is being constructed in the form of a loop, taking one course between the termini in one direction and returning by another, it is set down as a 12-mile road.

What has made necessary and possible the construction of such a road in that part of the country; a road which, for completeness of appointment can not be excelled in the most thickly populated and wealthy sections of the East? This question may be answered in a few words: The development of southern Idaho. The changes wrought in that section of the state are phenomenal. On the sagebrush plain of seven years ago are now to be found hundreds of well-tilled farms, countless orchards, miles of well-made roads, and scores of prosperous towns and cities. It is as if some modern Aladdin had rubbed a magic lamp. The work of transformation has been accomplished quietly; without puffery or blare of trumpets.

In this instance the magic lamp was irrigation; a work in which some \$18,000,000 has been invested, and the like of which for substantiality, completeness of detail, and practical worth, is nowhere else to be found. And the strangest part of all is that this immense sum of money was raised and invested by private parties who had confidence in the country. There has been no government aid, no graft, no scandal. Every promise has been carried out exactly as laid down. Unlike some other irrigation projects there is an abundance of water, and it is delivered as the settler sees fit to use it.

In southern Idaho, on both sides of the Snake river, reaching from Milner to Clover Creek, is a large tract of rich land. This, so far as it has been surveyed, is about 50 miles in width from east to west, and 65 miles in length from north to south. The soil is a thoroughly decomposed volcanic ash, rich in the elements of plant food. Wherever water has been applied systematically and intelligently the crop yields have been enormous. Irrigation in some form has been utilized for many years in scattered sections but the results were not wholly satisfactory, the principal reason being lack of a dependable water supply and scarcity of transportation facilities for reaching markets. It was not until the section referred to was opened up by the Oregon Short Line

that irrigation on a comprehensive, profitable scale became a possibility. Among the first to recognize this was I. B. Perrine, of Blue Lakes, Idaho. Like most pioneers in great movements he was, in the beginning, looked upon as an enthusiast lacking proper mental balance. His idea of transforming the sage brush waste into fertile farms and prosperous towns was a mild, harmless species of lunacy.

Nothing dismayed by jibes and jeers, Perrine kept at it until he interested H. L. Hollister, of Chicago, and Frank S. Buhl, a rich steel manufacturer at Sharon, Pa. Hollister and Buhl went to Idaho, traveled over the land with Perrine, decided his scheme was feasible, and enlisted in the enterprise. Then came the making of the surveys and the drawing of the working plans. This required years of slow, patient work, and it was not until 1903 that the actual work of construction was begun.

While the country in which this work has been done is known as the Twin Falls section, this name applying indiscriminately, it really embraces four great projects, each independent in itself, but being adjacent and under the control of the one body of men. These projects are designated as the South Side tract, North Side tract, Salmon River tract, and Twin Falls-Oakley tract. The combined area subject to irrigation is something like 650,000 acres. To water this 3,000 miles of main canals and laterals have been constructed, the water being taken from the Snake and Salmon rivers. Some idea of the immensity of the work may be had from the fact the main dam on the Snake river at Milner cost \$1,000,000, that on the Oakley tract about the same, and the impounding dam on the Salmon river fully \$1,000,000, if not more. The main canal on the North Side tract is 60 feet wide at the bottom, 80 feet at the surface, and carries 3,100 cubic feet of water a second. In one section of this canal there are over five miles of solid masonry wall, and two miles more are lined with concrete. All the main headgates and controlling gates are constructed of concrete and steel.

A close second to the irrigation enterprise in magnitude and importance is the power which has been—and is still being—developed. In addition to a fine plant at Shoshone Falls now in successful operation, similar plants are being pushed to completion at Upper and Lower Salmon Falls, and at American Falls, making four in all. The immediate commercial value of these power plants has been appraised at \$7,000,000. Mr. Perrine, an agriculturist, naturally had the irrigation project uppermost in his mind. Mr. Hollister, a business man, realized the wonderful possibilities for power development. Conditions were such that the two projects fitted together nicely.

There was a struggle to raise funds. It was a mammoth undertaking. Money by the millions was required. Mr. Buhl, his brother-in-law, a Mr. Kimberly, and Mr. A. D. Milner furnished the funds for construction of the dam on the Snake river at Milner. Later, when Messrs. Perrine and Hollister undertook similar projects on adjacent lands they interested the banking firm of W. S. & J. S. Kuhn, of Pittsburgh, Pa., which financed the work. This was the last large enterprise of this nature in which the Kuhns—who failed recently—were interested. It may be well to explain that the failure of the Kuhns in no manner affects this irrigation project. This is independent of

Kuhn control. The Kuhns merely acted as fiscal agents in placing bonds on the work. All the land has been sold and the money being paid in by the purchasing settlers is being used to liquidate the bonds issued by the construction company.

Title to the land itself is taken under the Carey Act direct from the state at the rate of 50 cents an acre, one-half of which, or 25 cents, is payable at time of entry. No entry can be made, however, on land which is not susceptible of being irrigated. Perpetual right to the water costs from \$35 to \$60 an acre, the latter being the prevailing price on the South Side tract. Payments are strung out over a period of from ten to twelve years. The first payment is usually at the rate of \$3.25 an acre (including 25 cents an acre to the state). This makes the first payment on a 40-acre tract \$130, with \$1 extra for recording the contract.

As the crops raised are phenomenally large, and

In the vicinity of Twin Falls there are 15,000 acres in orchards, principally apples, this section rivalling the famous Hood river valley of Oregon in the perfection of size and flavor of this fruit.

A large proportion of the settlers come from the East and the Middle West, farmers, mechanics and professional men of intelligence and worth. The entire Twin Falls country shows the advantages of securing this class of people. Not only is the country well farmed, but many thriving towns and cities have sprung up. Chief among these is the city of Twin Falls, a place of from 8,000 to 10,000 inhabitants. When one looks at the well laid-out city with its handsome buildings, attractive homes, and busy mercantile center, it is hard to believe that a short seven years ago this was a wild sagebrush plain. The erection of a rude frame shack to serve as a real estate office was then considered an audacious proceeding, and doubts were expressed as to the sanity of the men



Flume 300 Feet Long, 64 Foot Span and 44 Feet High Erected Near Forsyth, Montana, for the Yellowstone Irrigation District by the Klauer Manufacturing Co., Dubuque, Iowa.

there is little or no expense for clearing the ground beyond removing the sage brush, many settlers find that the income derived from the land is sufficient to meet their living expenses and more than pay the annual installments. Alfalfa, all kinds of hay grasses, vegetables and fruits grow in profusion. To attempt to give well-authenticated money yields would sound like the yarn of a Munchausen. A net income of \$100 an acre is well within the truth. There are instances, supported by affidavits, in which the net yield has run from \$500 to \$1,000 an acre, but these are exceptional and secured only by extra care and highly intelligent cultivation. While hay, grain and vegetables are all profitable, fruit is the great money maker.

who were so reckless. Today the building of a \$25,000 structure occasions no particular comment. Twin Falls must be seen to be appreciated.

There are few places in this country where more attention is paid to the social, educational, and religious needs of the people. Nearly every known religious denomination is represented and well housed, there are unusually handsome public schools and county buildings, and a number of up-to-date clubs and hotels. Three schools cost \$250,000, the county building \$150,000, and thousands of dollars have been expended on roads and similar public utilities. There are three modern hotels. These are the Perrine, the Rogerson, and Justamere Inn. Male club life centers

at the Twin Falls Commercial Club, while the female part of the community supports a number of organizations.

It would not be amiss to call Twin Falls the "Electric City." Current is supplied from the power house at Shoshone Falls, six miles away, and electricity is employed whenever possible. The streets and homes and stores are lighted and heated by it, street cars moved by it, factories operated, and most of the cooking done in the same way. In connection with this latter feature there is an interesting story. When the power house at Shoshone Falls was opened and it became known that the current was to be largely used at Twin Falls, a Massachusetts firm engaged in the manufacture of electric cooking ranges had one of its salesmen stop off there to size up the situation and see whether a market could be made for the firm's product. His report must have been satisfactory, for the first shipment to Twin Falls was an even carload, and since then more have been sold. This, as the firm in question admits, breaks the record for a city of that size.

Shoshone Falls are located on the Snake river and constitute one of the great natural wonders of the world, in one respect at least greater than Niagara, as the fall of water is 50 feet more, and the downpour much more turbulent. Niagara's cataract is 164 feet high, while that at Shoshone is 210 feet. Comparatively few people have hitherto visited this wonder spot because of the difficulty of reaching it. The only available route was over the main line of the Oregon Short Line from Granger, Wyoming, to Shoshone village, Idaho, a distance of approximately 322 miles. From Shoshone village the trip to the falls required a ride of 35 miles southward across the prairie to the Snake river by stagecoach or similar conveyance. Arriving at the falls the visitor found himself at the top of a canyon, facing a precipitous descent of from 800 to 1,200 feet, according to the path taken. Few people had the courage to descend to the level of the river at the falls and contented themselves, after making the wearisome, expensive journey, with looking down from the top of the plateau.

Now all is changed. Shoshone Falls is brought within easy, inexpensive reach, and the same people who have turned this part of Idaho into a veritable fairyland aim to make the grim Shoshone out rival Niagara as a resort for tourists who desire to see one of the great natural curiosities of the country, while taking in the western wonderland. Shoshone village, as explained, is 35 miles north of the Snake river. The city of Twin Falls is three miles south of the river and six miles from the falls. The Oregon Short Line has constructed an extension of its road from Minidoka westward directly through the Twin Falls country, the city of Twin Falls being the main station on this extension. It is now possible to travel from Omaha to Salt Lake over the Union Pacific, leave Salt Lake at night in a comfortable sleeping car, and reach Twin Falls the next morning.

It is to afford an easy means of reaching the falls that the Twin Falls Railway Company is constructing an electric road over the six miles of intervening country. The right of way is all graded, rails have been laid to a point well beyond the city limits of Twin Falls, and the rest of the work is being

pushed with the energy which characterizes the people of that part of the country. There are no idle dreamers there; to think is to act. Once convinced that a project is feasible and desirable it is carried through, no matter what the cost. An immense amount of electric power is generated at the Shoshone Falls power house, the current being conveyed to Twin Falls by wires strung on poles. As the electric road does not follow the course of these poles, going out one way and returning another so as to cover as much territory as possible, the current-carrying outfit now in use cannot be utilized. Consequently storage battery cars are employed. Two of these cars, costing \$11,000 each, have been furnished by the Fed-



The Needle, Iao Valley, Maui, Hawaiian Islands.

eral Storage Battery Company, of Silver Lake, N. J. (an Edison concern), and are in active use.

In the early part of May last—the 3d inst.—these new cars made a trial trip over the rails of the Oregon Short Line from Twin Falls to Buhl and return, a distance for the round journey of 34 miles. Use of the Oregon Short Line tracks was granted as a matter of courtesy, the electric company not having enough of its own rails in place to afford a satisfactory test. Some 90 guests took part in the jaunt, many of them being expert electricians and railway men. The run from Twin Falls to Buhl, 17 miles, was made in thirty-five minutes, including stops. There was no attempt at record-making time. Returning, the distance was covered in forty minutes.

While the Twin Falls Railway was projected and is being constructed with the principal purpose of exploiting Shoshone Falls by making them easy of

access, President Perrine admits that it has a much larger field. It is in reality the initial link in an extensive system of electric roads which is soon to gridiron all that part of Idaho, and plans for which are even now in preparation. These roads are made necessary by the rapidity with which southern Idaho is growing, and the ever-increasing demand for means of inter-communication and transportation. Thanks to its generous water power, electricity is cheaper than steam in Idaho, and consequently it is rapidly displacing the latter as a motive force. Hence the electric lines.

Stock raising, the growing of hogs, sheep, and cattle has become an important industry in that section of the country. Farmers find in this a highly profitable means of utilizing their surplus hay and grain crops, better than selling the crop products no matter how high the price may be, as it affords a



Waiehu Falls, South Fork of Wailua River Kauai, Hawaiian Islands.

means of not only getting a big price for the hay and grain, but at the same time adds much-needed humus material to the soil. Rich as this soil is, it is undeniable that it is lacking in humus. This, however, is readily supplied by the application of stable manure, the plowing under of cover crops or alfalfa and clover, and decayed straw. Even the farmers who are growing rich by raising fruits and vegetables are fast coming to recognize the fact that it pays to give attention to livestock.

Facilities for the movement of products to market must be provided, and it is the purpose of the promoters of the electric railway system to secure this by making connection with the steam roads easy, while at the same time furnishing transportation for

passengers. This is one reason why the electric lines are being constructed of standard gauge so the cars may be interchangeable with those of the steam roads if desired.

What can the newcomer to Idaho do? This is a question in which a large number of people are interested. Much depends upon the amount of capital he has and the size of the tract he buys. Most of the land is disposed of in 40- and 80-acre tracts. The former is enough for the average man. If he is unusually energetic and has the monetary means to hire help he may handle 80 acres satisfactorily, but it is not advisable at the start. Clearing the land of sagebrush and putting it in shape to irrigate and crop, seeding and harvesting, will cost on an average about \$17.50 an acre. The first crop, aside from the vegetables and other supplies for home use, should be alfalfa, as it adds the necessary nitrogen and humus to the soil. For the first year the alfalfa yield will run from one to two tons to the acre, worth from \$7 to \$12 a ton. The second and succeeding years will show better returns. Expenses the second year for irrigation and harvesting (there will be no reseeding), should not exceed \$12.50 an acre, against which there should be at least six tons of alfalfa worth conservatively \$60. Alfalfa, for the reasons given, is the most desirable crop for the first few years on new land. After that general farming and fruit raising, which are much more productive, may be taken up.

No observing person can travel through this part of the West without being strongly impressed by the wonderful results accomplished by a few determined pioneers. In a way these results are the outcome of monopolies wisely directed. Each man concerned in the development of the country has had his particular work to do and has done it in his own way, unrestricted by the others. There has been, of course, a community of interests, each man working toward a common end, but doing it as he saw fit without hindrance. Thus, the Buhls, the Milners, and the Kuhns have constructed the irrigation plants, and how well they have done it a visit to the scene will tell. I. B. Perrine has had charge of the making of improvements and conveniences as they were needed. The city of Twin Falls and numerous thriving settlements are monuments to his enterprise. Sales of lands, the securing of a desirable class of settlers, has been in charge of H. L. Hollister. That this important feature has been well conducted is evidenced by the fact that, while there are now between 30,000 and 40,000 people in the Twin Falls country, there is a noticeable absence of discontent or disorder. Almost without exception these people are happy, contented and prosperous. Occasionally some lone individual, having proved up on his land, desires to sell out, although this is rare. In such case if the holding has been well tilled and improved he has little trouble in getting \$200 an acre for what cost him from \$25 to \$65, and is ahead the yearly income from his crops in addition.

Wildly exaggerated stories are in circulation regarding the yields obtained from Twin Falls farms and orchards. This, perhaps, is only natural, but at the same time such reports are harmful and unwarranted. The truth is strong enough. When it is known, beyond doubt, that intelligent cultivation will secure a net income of \$100 to the acre, what's the use of "drawing the long bow" of overdoing it?

HOW DEAD AND INANIMATE NATURE GROWS.

By Dr. Leonard Keene Hirshberg, A. B., M. A.,
M. D. (Johns Hopkins).

Although the tradition of spontaneous generation to the birth of living things from nothing was finally and forever disproved by pasteur only to be revived last year by Dr. H. Charlton Bastian of England and again definitely disproved by practically all living biologists, no one has yet arisen in the scientific world who dares deny that inanimate, inorganic mineral bodies in certain forms grow and multiply.

Even school children are all familiar with the growth of larger plant and animal life. Advanced students see the recondite phenomena of cellular growth and microbic multiplication may be watched by the trained biologist. But even the observant misses the assembling of powers that go to form the tissue, the cell, or the protoplasm, and in this respect he is more limited in his vision than the physicist, chemist, or mineralogist who with his experienced eye glued to the microscope may be witness to the very birth, not to speak of growth of an inanimate, inorganic crystal. He may thus with Pistil maintain that the biologist sees no very different force in animate growth than he himself sees in the analogous productive and growing forces by which crystals wax large, bud out, and expand.

Anyone may see the beautiful growth of crystals. It is no privily arranged phenomenon, open only to an inner circle, a privy council, a secret elect. Go to your family doctor and ask him to show you the actual process of crystal growth. He will more than likely prepare a solution of "lunar caustic" which is silver nitrate in chemical nomenclature. Properly prepared it is silver dissolved in nitric acid and is as clear as water. In this form the silver cannot be seen with the naked eye, nor even detected in this combined form of nitrate of silver, with the most powerful microscope. Now if a few drops of this are placed in a watch crystal beneath the microscope and a piece or two of shining copper be added to this and the eye quickly placed over the microscope in a position to watch everything that occurs, lo! and behold, the pure silver will be seen to free itself in the liquid and a magnificent fern tree will grow right beneath your eyes. In the same way many other elemental trees of gold, lead, bismuth, and mercury may be grown in a few seconds.

Sunlight, electric light, gas light and all varieties of light are unsuitable for microscopic observations of a certain kind. Hence it is helpful to the microscopist to employ as aids a series of glass prisms which go by a special name—the microscopolariscope. As the light passes through these prisms, the light is bent or bowed, and is said to be polarized.

One of the uses of this instrument is to aid the eye in watching colorless crystals grow. Sugar, strychnine, salt, and many other substances soluble in alcohol and ether, which form crystals, may be seen to arise, grow and give birth to daughter crystals

(Continued on page 324.)

YELLOWSTONE IRRIGATION DISTRICT, MONTANA

The attention of our readers is called to an illustration in this issue of a flume near Forsyth, Montana, which was erected for the Yellowstone Irrigation District. The canal of this system is twenty-nine miles long, starting six miles west of Forsyth and running to the town of Hysham. The Klauer Manufacturing Co., Dubuque, Ia., took the contract for building the ditch, pipe line and flume complete and accepted irrigation bonds in payment. This ditch will irrigate about 13,600 acres and the cost per acre will not exceed \$20.

The Yellowstone river is the source of supply, and being a gravity ditch the cost of maintenance will be light. The land under this system is considered equal in point of productiveness to any in Montana.

There are between six and seven hundred people living on this tract and over two-thirds of the ground is already under cultivation. The main work will be completed in about 30 days.

ALFALFA FOR POULTRY

(Philo K. Blinn, Colorado Experiment Station, Rocky Ford, Colorado.)

Alfalfa is one of the best plants to furnish green food for chickens, but ordinarily it soon kills out if over-pastured.

Alfalfa crowns that have been cut off and plowed under and that have taken root again, are much harder to kill out, as many have found by repeatedly grubbing out the same stool that has taken root the second time. Such crowns seem to put out shoots from each piece of root that is left in the ground, if the soil is in favorable condition.

Those who desire to establish alfalfa in their poultry yards can succeed in this way by plowing or spading under alfalfa crowns that have been freshly plowed out from some field near by. Early in the spring is the best time, while the crowns are still dormant. The crowns should be covered four to six inches deep, and the soil wet down and kept moist and the chickens kept off until the crowns have become established, which will be much sooner than by alfalfa seeding, and will stand much harder pasture.

CLEANING OLD PAINT BRUSHES

(Jerome B. Frisbie, Colorado Agricultural College, Fort Collins, Colo.)

Dissolve one part of crystallized sodium carbonate in three parts of water and put the solution in a jar about six inches deep, then suspend the paint brush in the solution with the bottom of the brush about two inches from the bottom of the solution. Keep the jar in a good warm place, with temperature of about 150 degrees for twelve hours or more. The dried paint will then become so soft that it can be easily washed out with soap and water.

SANITARY FLOORS FOR POULTRY, SHEEP AND HOG HOUSES.

Concrete Floors Are Effective in Preventing Vermin and Disease.

Poultrymen and sheep and hog breeders are finding concrete a very satisfactory floor material for their buildings. Concrete floors have no cracks in which lice, ticks and similar vermin can breed and are likewise proof against the attack of rats and other destructive animals. Moreover, concrete floors do not harbor disease germs and can be easily cleaned and disinfected. Properly built and cared for, they are not damp and do not cause rheumatism.

Planning and Laying Out Floor.

The first step in building the floor is to remove all manure and other foreign matter and then to grade the surface of the ground. If needed, lay all water pipes and the drains necessary for keeping the ground dry, for carrying off waste water and for conducting the liquids to the manure pit. Such earth filling as may be necessary must be dampened and thoroughly tamped. This work should be done as long as possible before building the floor. Keep the concrete from direct contact with the earth by covering the entire surface of the leveled-off ground with six to eight inches of coarse crushed rock or screened gravel.

For grading the surface of the floors use a carpenter's spirit level (or a water level) and a chalk line. A four-inch thickness of concrete is sufficient. Slope the floor one-eighth inch per foot in such direction that the rain or scrub water will cause the least inconvenience. For poultry houses this will usually be toward the door; for sheep sheds and hog houses, away from the animal's bed and in the direction of the gutters.

Mixing and Laying the Concrete.

The usual proportions of concrete for such floors are 1 cubic foot of Portland cement to $2\frac{1}{2}$ cubic feet of sand to 5 cubic feet of crushed rock or screened gravel, or 1 part of cement to 5 parts of bank-run gravel. These materials are measured on the basis that 1 bag of cement (loose) equals 1 cubic foot. Mix them thoroughly on a tight wooden platform (never on the ground) and use enough water to make the concrete "quaky."

Lay the floor in a manner similar to sidewalk construction. If the sand and rock are first-class in quality, no finishing mortar is required. Such a mortar is generally mixed 1 part cement to 2 parts sand and is applied (1 inch in thickness) to the 3-inch concrete base before the latter has begun to set. To provide good footing for animals, the floor should be finished merely with a wooden float. A steel-trowel finish is entirely too smooth and, if made, should be roughened with a stable broom. Should removable wooden or gas pipe pen-

divisions be used, make mortises for them in the floor at the proper points by inserting short lengths of gas pipe or drain tile, or by tamping the concrete around tapering greased wooden cores, which must be withdrawn as soon as the concrete has stiffened.

With the proportions given above, 4 bags of cement (1 barrel), $\frac{3}{8}$ cubic yard of sand and $\frac{3}{4}$ cubic yard of crushed rock will lay a section of floor 8 feet square by 4 inches thick. The cost for the materials alone will be about \$2.50. As to the labor, ordinary farm help can do the work very well.

Proper Care of Animals and Floor.

Regardless of the material used for the floor, a certain amount of covering must be provided for floors of houses for poultry, sheep and hogs. Floors of poultry houses should be covered with a layer of sand or litter. The floor of the sleeping quarters



Concrete Hog-House Floor with Wallow at End.

of a hog house should be provided with a removable slatted wooden platform, which must be well supplied with bedding of straw or litter. Likewise the floor of sheep sheds should be kept bedded, especially during the lambing season.

Concrete floors are the cheapest as they never have to be repaired or replaced. Moreover, they can be flushed out with a hose or thoroughly disinfected with oil or other substances without injury to the concrete. They are effective in aiding the prevention of cholera and foot-rot. On account of their sanitary qualities they greatly increase the profits of poultry, sheep and hog raising.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics, add \$2.50 to above price.

KEEPING FOOD IN SUMMER.

The Department of Agriculture has issued the following practical suggestions in regard to keeping food and drink in hot weather, with a view to helping the public to avoid sickness from eating spoiled articles of diet:

"While people should be careful about the condition of the food they eat at all seasons of the year, they should be particularly watchful during the summer months. In hot weather, bacteria multiply far more rapidly than in cold weather and produce chemical changes in some foods which greatly lessen their nutritive value and often make them unfit for human consumption. Unfortunately, there is no quick, absolute, simple, practical way of determining the presence of hurtful bacilli in foods, or of obtaining positive evidence of the existence of ptomaines. The average family does not have the delicate apparatus needed for these tests, nor the skill to detect these micro-organisms.

"The housewife will find eyes and nose the safest practical detectives of bad food in hot weather. If any article has any suspicion of an unusual odor or looks abnormal, it should be avoided. People eating in doubtful restaurants should be particularly careful about meats or fish cooked with a highly spiced or aromatic sauce which might disguise a bad taste or warning odor. Only sweet smelling, clean food should be eaten. Spotted, green, slimy or frothy raw meat, or meat which is soft in spots also should be regarded with suspicion. Taste of course is a supplementary test, but one to be used after eyes, nose and fingers. A mother before she allows her child to eat anything should examine it carefully in a good light, smell it, and finally taste it.

"Milk particularly deteriorates rapidly under summer heat, especially if it already contains bacteria. Housewives, therefore, should see to it that their milk after being left by the milkman does not stand for any length of time on a hot back porch or stoop before it is put in the ice box. Milk bottles should be kept closed, both in the ice box and out of it. If there is any doubt at all as to the excellence of the local milk supply, pasteurize all milk.

"All foods should be kept covered or wrapped, and always out of the reach of flies, which are deadly carriers of typhoid. All vessels, pitchers, etc., in which food is to be stored should first be scalded. Food should be handled as little as possible. The ice box, especially its drain pipe, should be cleaned thoroughly and frequently with boiling water and washing soda, and given an occasional airing. A persistent battle should be waged against flies in all parts of the home.

"Uncooked foods as a general proposition should be avoided. Children should not be allowed to eat the skins of fruits, especially fruits which have been exposed to flies or street dirt on unscreened stands or push carts.

"Those who go away for vacation should not get the idea that everything in a summer resort or strange city is necessarily pure and wholesome. The danger of typhoid fever in country resorts is very great. Many of the cases of typhoid fever recorded in the fall in cities where the water is pure

had their origin in water or contaminated substances drunk or eaten at some summer resort. Insist on boiled water. If you absolutely cannot get boiled water, make very sure about the reputation of springs, wells, or tap water. Refuse absolutely to take any water that comes from a source near an outhouse or stable, or in a neighborhood where fever is at all prevalent.

"Boiled water can be made just as palatable as unboiled water. The flat taste which boiled water has soon after it has been boiled is due to the fact that boiling drives out of it the air which it held in solution. If the water after boiling is put in scalded shallow open pans and allowed to stand for 24 hours where flies or dirt cannot get at it, it will regain its air and have its usual taste restored by the second day.

"Finally, it is particularly important in summer that people should not be misled into believing that the label 'Guaranteed under the Food and Drugs Act' on cans and packages means that the government has tested these foods and pronounced them pure and desirable. The government does not make the guarantee. The guarantee is made wholly by the manufacturer, and means no more than when your own corner grocer guarantees that the sugar he weighs out for you is all right. Examine goods labeled 'guaranteed' just as carefully as any other kind."

CORRESPONDENCE

Editor Irrigation Age:

I have noticed, in a recent issue of the AGE, an excerpt from an Idaho journal containing sentiments that I most heartily applaud and which certainly deserve the commendation of every fair minded man. In a consideration of this subject it would appear as though the newly appointed "Irrigation Securities Commission" of Idaho could profitably direct its attention to certain long neglected phases of the situation. This state, in common with certain others of the arid land commonwealths, is suffering severely—has been doing so in fact since 1911—from the inevitable results of the errors of "omission and commission" of former days. The commission is certainly confronted with an Herculean task and while the purpose of its creation may have been good, its activities, in my judgment, will have been thrown away, unless it decides in a wholehearted manner, to lay bare some of the evils of irrigation finance. Everyone at all familiar with the subject knows why irrigation securities are discredited. Some of the reasons most generally made clear I exploited in a series of papers published in the *Financial World* of New York in 1911 and 1912; at bottom the fault lies with the states themselves; in their criminal and reckless disregard of the most elemental obligations: (1) Properly to safeguard their water resources, vide, the outlived "systems" only recently discarded by some of the states and still in existence in others; (2) To exercise any form of control over the operations of organized irrigation, whether "private," "irrigation district," or "Carey Act"; (3) (And this applies to Idaho's Carey Act projects and Colorado's districts with particular force), the extent to which the states in the past have permitted these classes of enterprises to be conducted by all manner of incompetents or freebooters constitutes the severest possible arraignment. I called attention to the situation in a number of signed articles, the latest appearing in the *Denver Republican* last December, and my statements have, so far, gone unchallenged, all of the states have adopted, within the last two years, more Carey Act statutes and regulations which, had they been in operation a few

years ago, would have greatly benefited the entire industry. While the enactment of these measures is entirely wholesome, they partake largely of the nature of "locking the barn after the horse is stolen."

The plain fact of the matter is that confidence in all these enterprises has been shattered. This applies equally to the investment in securities and to the settlement of lands. Let anyone who doubts this statement indulge in a tour of the former "boom" districts of the west.

The Carey Act states, with one or two exceptions have, in the past, lent their official countenance to the most unmerited enterprises and thousands have been led to invest in worthless lands, water rights and securities upon the specious pretext that these flotations were in some way safeguarded by both state and federal governments.

Some of the lurid "booster" literature of the period prior to 1911 throws an interesting light upon the methods then in favor. As you well know, I introduced at the Irrigation Congress of 1910 and 1911 the more or less famous "Anti-Irrigation State" resolutions which, in each case, called for real, instead of perfunctory, state's control and which was unanimously adopted. At Salt Lake City, Mr. George A. Snow, chairman of the board of governors, presented to the congress an adequate and complete plan for "commission control" by the states.

The early months of 1913 presented a psychological opportunity for "field work" by the congress with the state legislatures, but this most important work had to be neglected because the congress was then struggling for its very existence.

It is not necessary to digress upon this point—the kernel of the whole situation is that the states, by their long career of criminal neglect, have brought the present era of distrust and paralysis upon themselves and are saddled with a real and tangible moral obligation which only one of them, so far, has had the courage to face and to take steps to discharge. I refer to the state of Oregon which, largely as a result of the influence of its enlightened and high minded state engineer, John H. Lewis, has recently appropriated the sum of \$450,000 for the completion of the unfinished and bankrupt "Columbia Southern Project," for the relief of its settlers and to redeem the good name of the state. There is an example of the only kind of remedy—to acknowledge error and to right it even at a cash cost.

This state has gone a tremendous distance ahead of all others in the direction of "conservation and co-operation" with the federal government, but that is another story.

Neither is there wanting in Idaho a decent element that deplores the shame of the state and it has succeeded at least in carrying a "joint resolution" authorizing the use of the "Carey Act trust fund," for the completion of unfinished projects. Even this much was accomplished only after a hard struggle. The measure is good enough as far as it goes, but it simply begs the question. As one example, the entire trust fund would not suffice to half complete the "Big Lost River" project.

For the last analysis, the safety of any security depends upon the number and kind of settlers, how soon they enter the land, how long they "stick" and whether they can "make good." This class of people has been "frisked" so long and so often that it refuses to listen to any more siren songs, and stays away.

There's your answer—it is arrived at through no dubious process of reasoning, but through the logic of fact. Let the Idaho Securities Commission ponder over it.

I do not wish one word of what I have said to appear as an impugment of the Idaho State Land Board from the regime of Ex-Governor Hawley down to the present day. It has been able, painstaking and conscientious and has done the very best possible, considering its statutory limitations, in the time. Sincerely yours, EDWARD BOHM.

The settlers on the Idaho Irrigation Company's project that covers 110,000 acres south of the Magic Dam, and upon which the towns of Richfield, Dietrich and Gooding are located, will be granted five years additional time to make their final payment for water.

FOREST NOTES.

A shingle mill in Maine uses 2,000 cords of paper birch each year in the manufacture of toothpicks.

The new Chinese republic has established a department of agriculture and forestry. For a long time China had been pointed out as the most backward nation in forest work.

A toy company at Sheboygan, Wis., started out to use only the waste wood from other mills. It has worked out a system of using all small waste pieces so that practically nothing but the sawdust is lost.

Austria not only sells timber but timber products from its forest lands, and disposes of about 1,500,000 railway ties a year. There is no provision in the United States by which the national forests can dispose of manufactured lumber, though the policy of selling standing timber is well established.

The Canadian government has supplied twenty-five million tree seedlings to farmers, principally in the Alberta and Regina plains region. The United States does not supply young trees to the public, ex-



Rumely Oil Pull Tractor, making trip from Rock Springs to Atlantic City, Wyo.

cept in a limited area in Nebraska, under the terms of the Kinkaid Act.

The national forests of Chile cover about 7,000,000 acres.

The forest service of India has demonstrated that teakwood grown in plantations is just as strong as that grown in natural forests.

Even the well-protected forests of Germany are by no means immune from fire, and the Prussian fire protection system makes use of lookout towers and telephones.

Much of the so-called silk nowadays is made of wood. Germany produces more than one million pounds of this cellulose silk, worth \$1,500,000. A ton of wood worth \$10 yields cellulose worth \$20, and this cellulose yields silk worth \$850.

Army bayonets now form part of the emergency telephone outfit of forest rangers, used chiefly in fighting fires. This emergency line consists of small instruments and a coil of fine copper wire. The wire is attached to the nearest telephone line, the bayonet is thrust into moist ground at the other end, and with the circuit thus completed the ranger can talk with headquarters, report his position, and summon fire fighters if necessary.

FACTS AND FIGURES ON THE OIL TRACTOR FOR THE FARM

By A. G. Barnet

The farmer contemplating buying a tractor naturally thinks of what the machine will do for him. How much it will save. He knows how much time and labor it requires for the different operations on the farm using horses, but the amount the tractor will really do seems hard to estimate



Fig. H E 1575. 15-25 H. P. Fairbanks-Morse Oil Tractor pulling six 14-inch plows 6 inches deep through sod on the farm of A. G. Russel north of Janesville, Wis.

in view of the claims made by various manufacturers.

Take the operation of plowing for instance. The farmer knows how much time and stock it requires to do the work. To estimate on the work with a tractor one may use the following figures, being certain always to note the exact nature of the soil and the per cent of grade of the hills on the land.

The most accurate tests on level ground where the tractor gets a good footing show the following draft per sq. inch of cross section of plow. (Cross section equals width of plow times depth plowed.)

In sandy soil draft is 3 lbs. per sq. inch of cross section of plow.

In clay soil draft is 8 lbs. per sq. inch of cross section of plow.

In clover sod draft is 7 lbs. per sq. inch of cross section of plow.

In virgin sod draft is 15 lbs. per sq. inch of cross section of plow.

In prairie sod draft is 15 lbs. per sq. inch of cross section of plow.

In gumbo draft is 20 lbs. per sq. inch of cross section of plow.

Taking for example a plow rig of five 14-inch bottoms and wishing to plow a depth of six inches figure the draft for the various soils as follows: (Cross section equals $5 \times 14 \times 6 = 420$ sq. inch.)

- $3 \times 420 = 1260$ lbs. draft in sandy soil.
- $8 \times 420 = 3360$ lbs. draft in clay soil.
- $7 \times 420 = 2940$ lbs. draft in clover sod.
- $15 \times 420 = 6300$ lbs. draft in virgin sod.
- $20 \times 420 = 8400$ lbs. draft in gumbo.

The manufacturers give the draw bar pull of their engines. To figure the number of bottoms which can be pulled, divide the draw bar pull by the cross section of one plow, multiplied by the draft per square inch of cross section of plow. Thus, plow, 14 inch; depth, 6 inches; soil, clover.

$$14 \times 6 \times 7 = 588 \text{ lbs. draft 1 plow.}$$

Let us say the draw bar pull is 4000 lbs. and the land is level and has good solid footing:

$$4000 \text{ divided by } 588 \text{ equals } 6.8.$$

So we can safely estimate on at least six bottoms.

Each 1% of rise in grade—rise of 1 ft. in 100 feet—adds 1% of the weight of the tractor and plows to the draft. A 5 plow gang weighs about 3300 lbs. and the best field weight of a 15-25 horsepower tractor is about 16,000 lbs.

Thus using the example shown above of 5 14-inch plows plowing to a depth of 6 inches, the drafts on a $\frac{5}{8}\%$ grade will be as follows:

$$\text{Sandy soil } 1260 + 965 = 2225$$

$$\text{Clay soil } 3360 + 965 = 4325$$

$$\text{Clover sod } 2940 + 965 = 3865$$

$$\text{Virgin sod } 6300 + 695 = 7265$$

$$\text{Gumbo } 8400 + 965 = 9365$$

Mr. A. G. Russel of Janesville, Wis., states: "In regard to my 15-25 oil tractor I would say I plowed 40 acres in 3 days and handled the plow and engine alone and pulled six 14-inch plows 6 inches deep. The third day I plowed 14 acres in 9 hours on 25 gallons of kerosene, costing me $6\frac{1}{4}$ cents per gallon. At present I am plowing sod, pulling the six 14-inch plows six inches deep and have plenty of power and get the best of service."



Fig. H E 1595. 30-60 Fairbanks-Morse Oil Tractor pulling sixteen 14-inch plows at depth of 5 to 6 inches.

The draw bar pull of the machine Mr. Russel owns is 4000 pounds, so pulling the load he speaks of is indeed a remarkable showing regardless of how light the soil is. Using Mr. Russel's figures shows a cost of 11 cents per acre for fuel.

Another operation on which the farmer has accurate figures is threshing. To begin with, with a steam thresher there is the engineer, a fixed

charge which it is impossible to avoid; then there is a man and a team to haul water and fuel. All these are unnecessary with an oil tractor. Also the necessity of a man getting up an hour or two earlier to get up steam is dispensed with. The experience of Mr. C. J. Robinson, Denholm, Saskatchewan, along these lines is of interest.

"You will be pleased to know that the 25 horsepower oil tractor which I purchased has netted me clear of expense \$1,397.00. I have had the engine for 4½ months, but during that time the engine has been idle for about 1½ months while I finished harvesting and prepared for threshing. I contracted with a neighbor to drive his 32-50 separator with all attachments this fall. We commenced threshing on the 2nd day of October and the engine ran without a hitch except insignificant troubles up to the present time. We have had a spell of severe stormy weather and I started and ran the engine with the thermometer at 26 degrees below zero. My engine ran while all



F. H E 1571. 32-50 Separator operator by 15-25 H. P. Fairbanks-Morse Oil Tractor on the farm of C. J. Robinson, Denholm, Saskatchewan. This man made a profit of \$1,397.00 on the Tractor alone in four and one-half months.

repairs or adjustments and as they are located at a distance from properly equipped machine shops, it is of the very greatest importance that the machines be of the most rugged construction so that breakages are reduced to a minimum and the least possible time be lost on account of repairs.

The following is the experience of Albert Andrews of Crystal City, Manitoba:

"With regard to the 15-25 oil tractor which I purchased, I wish to state that I have found it to be very reliable and more than strong enough to drive a 25-42 separator with all attachments. I would especially recommend any one desiring a tractor easy to start and simple of operation to buy this special 15-25 type.

"The fuel consumption I find to be about 25 gallons per day."

A 15-25 horsepower oil tractor operated a 36x56 separator for E. B. Conibar, West Brooklyn, Ill. The average day's run throughout the 1912 threshing season was about 3,000 bushels of oats in nine hours.

Two tons is a good load for two horses on a hard road. A 15-25 oil tractor

will pull about 16 tons; a 30-60 oil tractor about 37 tons; thus simplifying the haulage of crops to market.

The big advantage of the oil tractor over the horses is the fact that the tractor is not an expense except while actually in operation. The horses, on the other hand, are a constant expense.



Fig. H E 1652. 15-25 Fairbanks-Morse Oil Tractor operating 36x56 Separator. The owner, Mr. E. B. Conibar of West Brooklyn, Ill., states that he threshed 3,000 bushels of oats in nine hours.

other engines in this locality were held up by the severe cold.

"The patent match striker is certainly a boon to the operator in cold weather and the steel gears operated at slow speed show no perceptible wear in spite of the fact that I did a good deal of summer fallow plowing.

"I consider my engine to be at least 35 horsepower judging it by its ability to run the separator with the tough grain we handled. In breaking the engine easily pulled six 14-inch bottoms.

"The repairs to date have cost me \$2.21."

The showing made by Mr. Robinson is worthy of consideration. Although he was inexperienced and handling a new machine he threshed continuously and had only a nominal repair charge.

As tractors largely go into the hands of men who, while they have considerable mechanical ability, have neither the time nor the facilities to make extensive



Fig. H E 1651. 30-60 Fairbanks-Morse Oil Tractor owned by M. K. Weems, Fort Morgan, Colo., pulling 5 wagon loads of sugar beets; there are about 7 tons to the wagon. This Tractor replaces 28 heavy horses and seven drivers.

Reclamation Notes

ARIZONA

Fred Bender, of Peoria, Arizona, makes the statement that for 32 years after he arrived in Arizona, not many changes of importance took place, and it looked very much as though his section of the country was doomed to remain in its primitive state indefinitely. In an interview with the correspondent of a Kansas City paper, at which city he was visiting and making purchases of pumps, etc., he made the statement that in places where irrigation is already in operation, alfalfa yields to the extent of \$80 an acre and has very good sale, and vegetable products and other crops raised also bring in immense revenue. Mr. Bender thoroughly believes in Arizona's future.

The warmest weather ever known to the county's oldest inhabitants is told by the surveyors in the Santa Maria country. The surveyors in that territory have been compelled to stop work on account of the intense heat.

Citizens of Sandy are sinking artesian wells to the depth of 60 to 100 feet and have already found ample supply of water for domestic purposes.

A Mr. Patterson of the McNeal section has been trying experiments on sweet potatoes and has found them a most profitable crop. He planted first a small tract of ground and learned that they did very well. Last year he planted a tract of two acres and cleared something over \$250 per acre. This year he has put in 40 acres to the same crop. He expects to do very well with it.

Luther Burbank, through his representative, Walter S. Johnson, is looking for a site in Arizona for a spineless cactus farm. According to Mr. Johnson, the government has allowed the Burbank company twelve sections of land for the enterprise, which is to be sold to the Burbank company for \$1.50 per acre. The spineless cactus is a crop that is beyond the experimental stage and good results may be looked for from this venture.

The Salt River was lower in June of this year than it has been in many years and farmers under the Roosevelt dam are beginning to realize the advantage of that great enterprise.

CALIFORNIA

An irrigation project north of Colusa which will take care of more than 7,000 acres between Cheney slough and the Sacramento river is to be constructed when plans now being formed are put into effect.

The jury in the case of the San Joaquin and King's River Canal and Irrigation company, against James J. Stevenson, a corporation, and others, brought in a verdict recently at Merced in favor of

Stevenson, after a trial lasting nine weeks and four days. The plaintiff in this suit sought the right by condemnation to 500 second feet of water from the San Joaquin river, owned by riparian right by the defendants.

Last January A. B. Stevens of San Jacinto bought 160 acres of unimproved land south of that city for which he paid \$12,000. He has recently sold the property for \$24,000, which represents a healthy profit.

Deeds were recently recorded showing a syndicate of Chinese had recently purchased a large interest in Venice Island, which is one of the most fertile sections in the state. The island belongs to the Venice Island Land Company and contains 3,432 acres, divided into fifteen camps. The property is all reclaimed and is surrounded with levies and has a system of irrigation.

The James Fair ranch in Yolo county, on the Sacramento river, shows one of the most remarkable "stands" of alfalfa ever seen in California. This is probably due to the fact that it has been sub-irrigated. This year is the driest in forty-eight years, according to records, yet this crop has never had a drop of surface irrigation.

The demand for land in the country of the right sort is exemplified in the success which has attended the sale of a tract of land near the town of Galt in the center of the Sacramento Valley. This property was put on the market three months ago, and from San Francisco alone numbers of buyers have gone upon the land, home building has progressed favorably, and quite an extensive acreage in the aggregate has been put into crops.

An irrigation district is being formed which includes 50,000 acres of land lying between Honcut and Palermo, Butte county.

Claiming that the San Joaquin Light & Power Company is asking them to pay too much for power, a number of farmers near Turk and Heron on the west side are said to be planning to organize a power company of their own, bonded for \$200,000, and erect a plant at a cost of \$180,000. It is said that this plant will irrigate about 6,000 acres.

Mayor Samson of La Mesa and a half a dozen assistants began the work recently of securing signatures of property owners and water consumers to a petition asking the county supervisors to call an election in the communities of La Mesa, Lemon Grove, Spring Valley and Grossmont, to vote to form an irrigation district. This is a new district which is being formed to take the place of the La Mesa, Lemon Grove, Spring Valley and La Mesa Heights Irrigation District which was formed a year ago. There will be 15,000 acres in this district, possibly 20,000.

As it was a dozen years ago when the first water crept into the main canals of the Imperial

Valley, the scene recently was impressive when the first water was turned into the new east side of the high line canal.

COLORADO

The Timber Land and Irrigation Company recently completed a deal whereby they have taken the George Paul Orchard Company for a figure that reaches almost \$100,000. This body of land contains 22,000 acres in orchard.

According to those interested, there has never been an irrigation season in the Arkansas valley when so much water has been lost by evaporation as during the present growing period. Every effort is being made by the farmers to conserve the water. The fact that many of them through experience have learned to use less water than formerly has been beneficial during this crisis.

Tests at the State Capitol School at Fort Collins on special soil irrigation are proving to be so very successful that the present mode of irrigation will meet with a complete revolution. The work being done at the college is on a small scale but the results are surprising to those that have it in charge.

Shallow pumping is one of the biggest factors in the development of arid areas of eastern Colorado.

Through the award of contracts for several thousand feet of motion picture films, it became known recently that the United States government is engaged in the moving picture business on a large scale. The enterprise is being carried on by the reclamation service in its camps in the west, a number of which have been established owing to the prosecution of great reclamation projects and other engineering work. The "movies" furnish their part in the general scheme to keep the workmen and their families, who are isolated from the balance of the world, contented and happy.

A. L. Dotson of Nepesta, general manager of the Dotson Irrigation System in eastern Pueblo county, stated recently that the work has just been finished on the construction of the gates at the Chi Chosta reservoir, of the system, southeast of Nepesta.

Dal DeWesse, the hustling irrigator of Canon City at a banquet held in that city recently, attacked the Denver papers seriously and unmercifully; scored them for the amount of space given to criminal news and the lack of space given to reclamation and general development news. He was inclined to think that the Denver daily newspapers are responsible for the tide of immigration going through the state to points further west.

Reclaiming arid lands in northern Colorado by means of irrigation pumping plants tapping the underflow, is to be one of the vigorous policies of the reorganized Northern Colorado Power Company. Lines will be put up for the delivery of power for operating pumps, and for general family

use, in a section of northern Colorado that heretofore was not reached by the company's service.

Henry L. Doherty, a famous banker of the east, has been making a general tour of Colorado and other western states studying conditions so that he may judge fairly of the merits of the various projects which may be placed before him for investment.

The Canon City country has been fortunate recently in getting splendid rains which have materially aided in bringing out the crops. This is particularly true throughout the Wet Mountain Valley district, where two and one-half or three inches fell recently and wet the earth to a depth of several inches. It was a great blessing, as the ground had become dry and hard and needed the moisture badly.

E. B. Wheeler, manager of the Bitter Root ranch in the Huerfano valley, about twenty miles from Pueblo, states that in his opinion the outlook for the bumper crop in that section of the state is very bright.

A substitute for alfalfa that will prove a boon to the entire state, especially to the dry ranchers, has been found in winter vetch, which is not only the equal to alfalfa in nutritive qualities but requires less attention and yields more bountifully.

The gigantic Uncompahgre valley irrigation project in Montrose county was delayed at one point in its construction by the refusal of A. E. Buddecke, a farmer, to sell a strip of land 10 by 50 feet crossing the canal, to the government. Condemnation proceedings were filed in the United States District Court.

The Secretary of the Interior has let a contract in the sum of \$109,668 to the Reynolds-Ely Construction Company of Salt Lake City, for excavation work on the Grand Valley irrigation project on the western slope. The contract covers part of the construction of a canal, which, with its laterals, will add about 80,000 acres to the irrigated area of the Grand valley. The division is five miles long and is east of Palisade.

The diversion of water from the western slope to the watershed of Southern Colorado for irrigation of land near Denver may develop into an interstate dispute. For many years there has been a controversy between water users of the west slope and the Henrylyn project near Denver over the head waters of the Grand river. The Henrylyn people propose to construct a tunnel through the Rocky Mountains for the transfer of the water.

One of the largest irrigation projects ever carried out in Colorado, providing for the watering of 200,000 acres of land in Moffat and Routt counties, which will be of much direct benefit to Denver, is to be put through by the Elk River Irrigation and Construction Company.

OREGON

Fifteen permits for the construction of reservoirs in the state of Oregon, at an estimated cost of \$1,500,000, were issued by the state engineer during the quarter ending June 30th. In addition, ninety-nine water and power permits were issued. The most important irrigation permits issued during that quarter were those to C. B. McConnell and Leonard and Emery Cole; of Burns, who contemplate the irrigation of 5,400 acres of land in Harney and Silver Creek Valleys.

The throwing open, by the Government, of 110,000 acres of land adjacent to Vale to homestead entry, promises to make that city the mecca of homeseekers during the next few months.

Attorney-General Crawford of Oregon, and Walter Van Winkle, members of the Desert Land Board, are now in the Deschutes Valley. They are contemplating buying a reservoir there to be used for irrigation purposes.

Alleging the law passed by the recent legislature which amended an old law pertaining to levying assessments in irrigation districts, is unconstitutional, J. J. Gibbons recently instituted mandamus proceedings in the Supreme Court of Oregon to compel the Head River Irrigation Company to levy assignments for this district under the old law.

Five thousand acres on what is known as Yelm Prairie, will probably be under water for the 1914 season. It is reported that work is progressing favorably on the Yelm Irrigation Company's project.

Development of a great water power at Bend has been started for the utilization of the water flow from the \$150,000 irrigation canal dam erected last year by the Central Oregon Irrigation Company.

UTAH

After a trial lasting several days, the jury in the District Court at Ogden, rendered a verdict for the defendant in the case of Lyman Skeen against the Warren Irrigation Company. The controversy involved the use of the Company's canal for conveying water from an independent canal to Mr. Skeen's land. The jury decided that Mr. Skeen may use the canal and that he must pay well to the company for said use.

An irrigation expert from Washington is in Logan, conferring with Prof. W. H. McLaughlin, who has charge of the government work of that kind here. The gentleman is interested in the workings of co-operative irrigation companies, and came here to get first-hand information as to the methods employed in the handling of water for irrigation purposes under the co-operative system. Professor McLaughlin had plenty of information on hand, and he also accompanied him in a tour of inspection of the different canals drawing water from Logan river and other streams in the county.

Prof. L. A. Merrill, experimental expert for the Salt Lake Route, has returned from Willows, California, where he has been studying the science of irrigation by pumping.

WASHINGTON

Three thousand acres of the first unit of the Montana land taken over by the Montana Land and Ranch Company, of Spokane, have already been disposed of at a figure between \$75,000 and \$100,000.

A. E. Wieland, of Wenatchee, has been selected by the Great Northern Railway Company to make a survey and estimate of the cost of construction of the east and west Okanogan Valley irrigation district.

A tract of land comprising 13,000 acres in the Southern Horse Heaven country bordering on the Columbia river, has been sold by the Worchester Fruit Land Company to the Washington Farm Land Company, which in turn has mortgaged the property to the Guaranty Trust Company of New York.

Work on the installation of the pipe line for the irrigation system for the city of Basco, is progressing rapidly.

Six thousand acres north of Spokane are to be irrigated and put on the market for use of a dairy colony.

The failure of the reclamation service to co-operate with the state of Washington in the re-survey in the Palouse reclamation project, for which funds were provided by the last legislature of Washington, has been due to the federal government's failure to take up the matter and co-operate with the state. It is reported that the federal government has been waiting a direct invitation to co-operate, and there is now no doubt but that they will receive proper encouragement.

MONTANA

In Secretary Lane's visit to Montana an effort will be made to interest him in a proposition for the reclamation of a lot of land known as the Merias diversion canal project.

The break in the canal of the Bitter Root Valley Irrigation Company in the Rock Creek district caused considerable trouble and necessitated cutting off the water while repairs were being made. It is not known that any crop losses have resulted.

A severe break occurred recently in the Billings Land and Irrigation Company's ditch near that city, the break being about fifty feet wide. The property loss to the land lying under the ditch amounts to from \$20,000 to \$30,000.

People in the northern part of Montana believe that Secretary Lane will order work continued on the Milk and Sun River irrigation projects. These projects, it is thought by the Montana people, will

(Continued on page 322.)

Supreme Court Decisions Irrigation Cases

ABANDONMENT OF WATER RIGHT.

An "abandonment" is an intentional relinquishment of a known right, the intention to be ascertained from the conduct and declarations of the party in respect thereto; and there was no abandonment of a reservoir and water right appurtenant thereto, though the owner gave up its domicile in the state, and there was a nonuser for a period of 10 years, where, before it left the state, it executed a mortgage on the property, and the mortgagee foreclosed and had a sale after its departure, as there was no intention of the mortgagee to abandon; and the mortgagor, by his failure to pay the license fees, etc., could not defeat the mort-

gagee's interest. *Moore United Elkhorn Mines. Supreme Court of Oregon. 127 Pacific 964.*

OVERFLOW WATERS.

A riparian owner of land on a stream in Oregon, a part of which is irrigated by the overflow water each spring and produces annual crops of grass, used by him for pasturage and hay, and which land, without such irrigation, would be valueless for practical use, has a vested right in such water, of which he cannot be deprived by another above him by an appropriation made under the state statutes (L. O. L. § 6525 et seq., or Act Feb. 24, 1909 [Laws 1909, p. 319]), both of which, while authorizing such appropriation, provide that no owner of lands on a stream shall thereby be

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deprived of vested rights acquired by the prior and continued actual application of water from such stream to beneficial use. *Eastern Oregon Land Co. v. Willow River L. & Irr. Co.* U. S. Circuit Court of Appeals. 201 Federal 203.

SUIT TO DETERMINE WATER RIGHTS.

The Water Code of Oregon (Act Feb. 24, 1909 [Laws 1909, p. 319]), creates a board of control, with authority on petition of a user of water from a stream after a hearing on notice to all other users or claimants to determine the respective rights of all parties, subject to review on exceptions by the court in which the order of the board is to be filed. It also authorizes any court in which suit is brought to determine water rights in its discretion to transfer the case to the board of control for determination. *Held* that, in view of such statute, a federal court in which such a suit was brought to enjoin defendants therein from using waters of a stream should require the parties to proceed under the act or to bring in all other persons in interest as parties. *Pacific Live Stock Co. v. Silvies River Irr. Co.* U. S. Circuit Court of Appeals. 200 Federal 487.

NEW MANAGER OF GOULDS CENTRIFUGAL PUMP DEPARTMENT.

The Goulds Manufacturing Company, Seneca Falls, N. Y., announce the recent appointment of Mr. F. Z. Nedden of London, Eng., as engineer in charge of the Centrifugal Pump Department.

Mr. Nedden's technical education was obtained at the Technical University of Berlin at Charlottenburg, where he graduated with high honors. His early practical training was obtained in the shops of the Berliner Maschinenbau A. G. vormals L. Schwartzkopff in Berlin and Wildau, from 1899 to 1906.

From 1906 to 1908 Mr. Nedden was assistant professor on gas and rotary engines and machines at the Technical University, Aix-la-Chapelle.

In 1908 he traveled through Europe by order of the senate of the Technical University of Berlin, investigating problems in connection with the manufacture and application of high lift turbo machines.

In 1908 he joined the Machine & Pump Factory of Messrs. Weise & Monski, Halle, Germany, and developed their line of high lift turbine pumps. In 1910 he was transferred to London and from that period until 1913 he developed their English and Colonial business. During 1912 he traveled in South Africa and Canada in the interests of this company.

Mr. Nedden has recently been making an extensive trip through the United States studying the technical and economical conditions of the market for Centrifugal and Turbine Pumps and has now taken up his duties with The Goulds Mfg. Company at Seneca Falls.

Mr. Nedden is the author of German Text Books for Engineering Students, which have been translated in English under the auspices of the Institute of Civil Engineers. He is also author of numerous articles in the technical press. He is a member of the Verein Deutsches Ingenieure, South Wales Institute of Mining and Mechanical Engineers and the South African Institute of Engineers.

Ready Now: The Primer of Hydraulics

By FREDERICK A. SMITH, C.E., Hydraulic Engineer

This new book is a splendid volume of over 200 pages of absolutely new matter pertaining to the subject of Hydraulics and its allied branches. All the subjects treated are handled in a simple and practical way to make them of use to the men who have been unable to obtain a college education, but who are successful practical men in fields where they require a knowledge of the principles of Hydraulics and instructions how to solve their problems in a simple and satisfactory way. This book is indispensable for anyone engaged in works relating to Hydraulics, Irrigation or Drainage; it is primarily designed for the practical man in the field, but will be equally welcome to the trained Hydraulic Municipal and Railroad Engineer especially, on account of the many valuable tables compiled by the author, which will save a tremendous amount of time in computations.

Condensed Table of Contents.

Article	I. General Properties of Matter.
Article	II. Algebraic Principles.
Article	III. Geometrical Principles.
Article	IV. Trigonometry.
Article	V. Mensuration of Plane Figures.
Article	VI. Mensuration of Solids.
Article	VII. The Principles of Mechanical Forces.
Article	VIII. The Three States of Matter.
Article	IX. General Hydraulic Principles.
Article	X. The Coefficient of Roughness.
Article	XI. How to calculate n .
Article	XII. Explanation of the "C" Tables.
Article	XIII. Open Channels—Problems.
Article	XIV. Closed Channels—Problems.
Article	XV. Pipes Flowing Full Under Pressure.
Article	XVI. Loss of Head by Enlargement of Channel.
Article	XVII. Subdivisions of Channels.
Article	XVIII. Loss of Head at Entrance to Pipes.
Article	XIX. Ditches.
Article	XX. Ditch Tables and Their Applications.
Article	XXI. Flow Measurements.
Article	XXII. The Use of Logarithms.

Tables.

Fourteen tables giving the factor C for all cases of channels for a coefficient of roughness; n varying from .008 to .050, inclusive, for channels having a hydraulic radius from .01 ft. to 900.0 and for slopes varying from .01 to .000025, thus practically covering every possible condition.

Tables of square roots of numbers used for r and s .
 Table of Hydraulic Elements of the Circle.
 Table of Hydraulic Elements of Composite Section.
 Table of Areas and Circumferences of Circles.
 Table of Hydraulic Equivalents.
 Table of Weights of a Cubic Foot of Various Substances.
 Conversion Table of United States and Metric Measures and Weights.
 Table of Squares, Cubes, Square Roots and Cube Roots.
 Table of Logarithms.
 Table of Natural Sines and Cosines.
 Table of Natural Tangents and Cotangents.
 Conversion Table, millions of gallons in 24 hours in other units.

Table of sizes of pipes or cylindrical conduits required for the flow of given quantities of water at given velocities.

Most all of these tables have been originated and computed by the author and have been checked in practical work and found to be correct, so that the tables alone will be worth many times the cost of the book.

The price of the book has been placed as low as is consistent with the superior quality of the work and it may be obtained on the following terms: \$2.50 a single copy, cloth bound; if order is sent with a new subscription to Irrigation Age or a renewal subscription, the book will be sent and the Irrigation Age one year for the sum of \$3.00.

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THE BRAHMA AS A UTILITY FOWL.

Uncle Isaac Felch, in recent writings, is again extolling the merits of the Light Brahma fowl as a utility bird. Mr. Felch in his contention is correct. He has shown that this variety cannot only be made excellent winter-egg producers, but that for broilers or roasters they have no superior.

The writer has bred Brahmas for years—probably as long as has Mr. Felch. The first love was the dark variety, but since the introduction of the Light Brahma that former variety seems to be placed in the background.

Between the two varieties, however,—the Light and the Dark—the former far excel. In point of plumage they about equally divide honors. But it is to the light variety that we wish to particularly refer.

As winter layers, Light Brahmas, if properly fed and cared for, will give more eggs than any other breed the writer has ever tried. Not only do they show their ability in numbers, but the size of the egg exceeds that of any of the American or Asiatic classes, and besides, the color—a rich brown—is of the best, and just such a shade that would fill the

breeders of the American class with joy.

It does not end with their laying. They will make quick broilers—in ten weeks from the time they are born they are plump chickens. We can never forget a lot of young stock we some years ago saw on a farm in Massachusetts. They were but sixty-one days old, and the weights were, cockerels,—we weighed only eleven—three pounds and one ounce for heaviest, and two pounds and four ounces for lightest. The pullets weighed two pounds and eight ounces for heaviest, and two pounds for lightest. These were live weights.

Mr. Felch himself accompanied us to that farm so that he might prove his contention that Light Brahma chicks at eight weeks of age make good, plump broilers.

But there is a market objection to the Brahma as a broiler. It occurs not in quality nor quantity of flesh, neither is it in the time of maturity, but simply in the fact that the American fad does not want feathers on the legs. And why not? We do not eat the legs, but the peculiarity of our market buyers say it spoils the appearance. We must cater to the whims of the market.

However, there is a place for them where there can be no ob-

jection, and that is in the roaster class. In this way they are ideal. Large enough and fit enough for a king. There is both quality and quantity of meat. At six months of age they are in prime condition, weighing easily a pound for each month's age—six pounds for six months—and if they are kept for a full year, and all that time properly fed and cared for, they will give twelve full pounds for that year's lease of life.

Truthfully it has been said the Light Brahma is the king of the roasting fowls, but we wish to add an amendment—it is the peer of the utility class.

It is not only hard to sell a lean chicken in market, but it is also poor eating. A little care and feed will make them more inviting.

It is claimed that a single-comb fowl fattens best. An English authority says he has found that a single-comb fowl always grows fatter and plumper than any others.



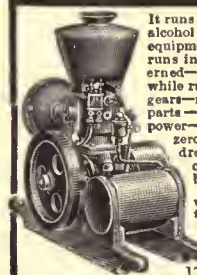
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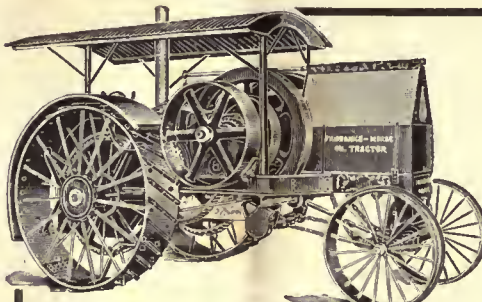
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For
Pumping, Hauling, Plowing,
Threshing, General Work

(Continued from page 318.)

be investigated in a short time by the secretary, personally.

Director Newell of the reclamation service, recently called for bids for constructing laterals and waste water ditches on the second unit of the Dodson North Canal, Milk River projects, involving 300,000 cubic yards of excavation, 1,200 yards reinforced concrete placing, 100,000 pounds of steel reinforcement and 140,000 feet of wooden structures.

Prickley Pear Valley, it is stated, looks better than ever before since its development as an agricultural district. This season has been a most favorable one for all the crops, there having been such an abundance of precipitation that even those ranches under irrigation ditches have had little need to turn on the water.

Gregg Brothers, who own 12,000 acres of land at Gage, a few miles east of Roundup, in the Musselshell Valley, have been at Roundup recently in connection with an irrigation project, which, if carried out, will add immensely to the value of land in the Musselshell Valley between Ryegate and Melstone.

WYOMING

Congressman Mondell has introduced a bill for a grazing homestead and for supplemental grazing entries of from 640 to 1,280 acres. Under this law the Secretary of the Interior will be authorized, on application or otherwise, to designate lands not containing merchantable timber, non-irrigable, and chiefly valuable for grazing, as grazing homestead lands, and to fix, according to the character of the lands designated, the area of an entry, which shall not be less than 640 acres nor more than 1,280 acres. Any qualified homestead entry man may make entry on these lands and secure title upon compliance with the homestead laws; but in lieu of proof of cultivation he may submit proof of improvement tending to increase the value of the lands for agricultural or grazing purposes to the extent of not less than \$1.25 per acre.

Surveyors employed by Kendrick & Day, a firm representing a French syndicate which proposes to construct the irrigation system which Joy Morton's Wyoming Central Corporation failed to construct after several years of dickering, are now running the survey for a railroad from the head gate of the main canal of the system from Riverton to Shoshoni. Here the line is intended to afford a direct outlet for the crops raised on the 300,000 acres which can be reclaimed.

MISCELLANEOUS

A company was recently formed of capitalists of San Francisco and Oakland to finance a big irrigation project in the Humboldt Valley in Nevada.

It looks as though Lane county, Kansas, will get a part of the \$125,000 appropriated for irriga-

tion experiments, as the samples of gravel removed from the test well and sent to the secretary of the Irrigation Commission has been considered favorably.

The power of the sun for pumping water for irrigation is shortly to be tried out near Cairo, Egypt, under the direction of Frank Shuman, an American. A 100-horsepower plant has been constructed, and the engineer hopes to have it in operation by the first of July.

The Secretary of the Interior has authorized the Director of the Reclamation Service to execute contract with the Reynolds Ely Construction Company of Springville, Utah, for the excavation of the Canyon Division Main Canal, Grand Valley irrigation project, Colorado. The division is five miles in length and its construction involves the excavation of 365,000 cubic yards of material. The contract price is \$109,568, subject to a possible reduction to \$108,488, if a certain alternative is accepted, the choice of alternative methods depending upon the execution of a pending contract between the United States and the Rio Grande Junction Railroad Company. The canal is located between two and seven miles northeast of Palisade, Colorado.

Tulane University. Very flattering offers were made W. B. Gregory, Professor of hydraulic engineering, by the deans of the Colleges of Engineering of the Universities of Illinois and of Texas. One offered the chair of the department of experimental-mechanical engineering and the other the chair of the department of heat engineering. After a personal investigation, Prof. Gregory has determined to remain with Tulane.

The College of Technology of Tulane, although but 19 years of age, has turned out a remarkable number of high-grade men considering the smallness of its graduating classes. There is, for instance, W. M. White, head of the hydraulic department of Allis-Chalmers Company and designer of some of the most powerful turbine motors in the world; Brunswick Sharp, of Norris Pump Company, designer of the 10,500 horsepower turbine motors used at Keokuk, Iowa, and in the various plants of the Alabama Power Company; St. John Chilton, head of the American Trading Company in Yokohama; Adair Monroe, vice-president of the Dyer Sugar Machinery Manufacturing Company; A. B. Wood, designer of the largest centrifugal pump in the world; C. C. Cromwell, in charge of Las Delicias, the finest and ultimately to be the largest sugar house in the world, and a huge number of others.

Part of the technical faculty is engaged in professional work this summer. Prof. Gregory is looking after a number of drainage propositions and is doing some experimental work for the government. Prof. Labouisse is designing a 13-story building and Prof. Derickson is checking the design of the steel framework. Prof. Metz of the chemical department is engaged on milk and other investigations for the city. The department of industrial chemistry will be put under Prof. C. S. Williamson, who will come to Tulane in October.

IHC Wagons Are As Good As They Look

TO really know the value of a wagon you must know of what material it is made, how it is built and about how many years of satisfactory wagon service you may expect. When you know all there is to know about I H C wagons it is safe to say that your next wagon will bear the I H C trademark—the stamp of quality and honest value.

Every piece of wood used in I H C wagons is carefully selected and air-dried. Only in air-dried lumber does wood retain its full strength and elasticity. All steel or iron is selected with the same care to secure the greatest possible strength. Thorough knowledge of the strain each part must stand is necessary because a wagon, like a chain, is no stronger than its weakest part. Every part of I H C wagons

Weber New Bettendorf Columbus Steel King

has the same relative strength. The men who build I H C wagons know why one part is built stronger than another, know the exact strain it will have to bear. This same thorough knowledge has enabled them to build a wagon of light draft, which puts the least strain on the horses, without impairing the durability of the wagon.



The finishing touch, the thing that adds to the life and appearance of an I H C wagon, is pure paint. Cheap paint may improve the appearance of a wagon for a short time, but after that is a positive detriment. Only pure paint is used on I H C wagons. It fills the pores of the wood, prevents shrinking, swelling, warping and twisting, and acts as a wood preservative.

There are many other reasons why I H C wagons are such good wagons. Weber and Columbus wagons have wood gears; New Bettendorf and Steel King have steel gears. Get catalogues from the I H C local dealer, or, write the nearest branch house.

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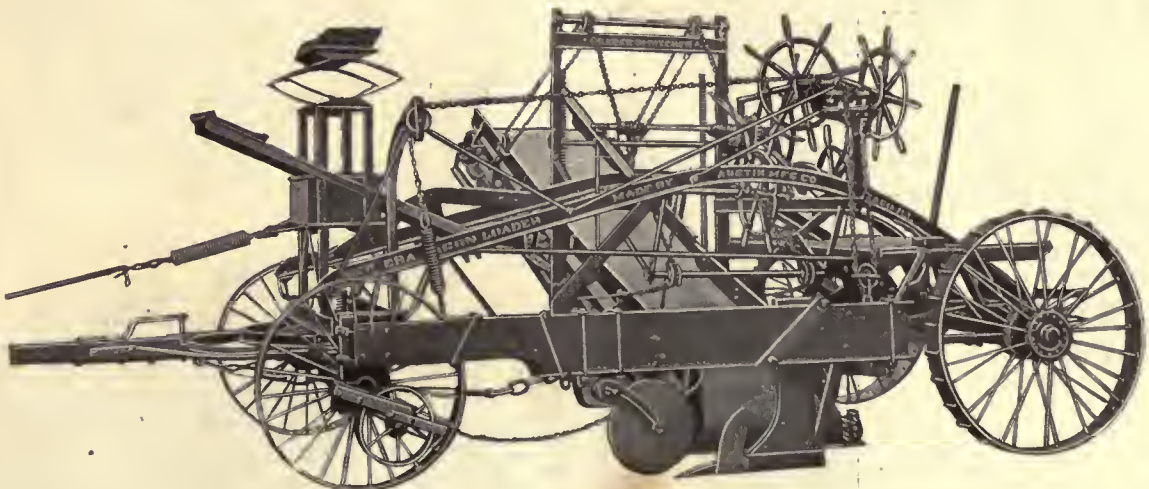
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The Cement Tile Machinery Co.

175 Rath Street,

WATERLOO, IOWA

(Continued from page 310.)

in this way. If benzoic acid or its first cousin hippuric acid is deposited on a glass slide and covered with a piece of thin glass, moisture from the air will supply what is known as water of crystallization, and tiny, flat, circular crystals will be soon noticed. Without batting your eye, you can see these acid crystals steadily growing, increasing as if endowed with life. The most beautiful and variegated play of colors, far surpassing those of a rainbow, will at the same time be seen. At the same moment, multitudes of the same sort of crystals are being born, growing, and crowding the other rapidly growing brother crystals. This has a mutual modifying action upon the shapes of the neighboring crystals. If the pressure still increases, the crystals will grow perpendicularly and soon expand and hang over the sides of the slides in beautifully decorative and rococo figures not unlike the hanging gardens of Babylon.

During the growth of the crystals almost any design might have been forced, although this is not possible on a large scale, when crystals are growing by themselves in their mother liquor. But these small microscopic solutions, always under the control of the skilled physicist, can be made to grow crystals of faceted gems, Byzantine drapery, feathery handings, Gobelin tapestries, and all sorts of designs of symmetrical, geometric, and fairy-like construction.

Almost any sort of crystallizable chemical can be

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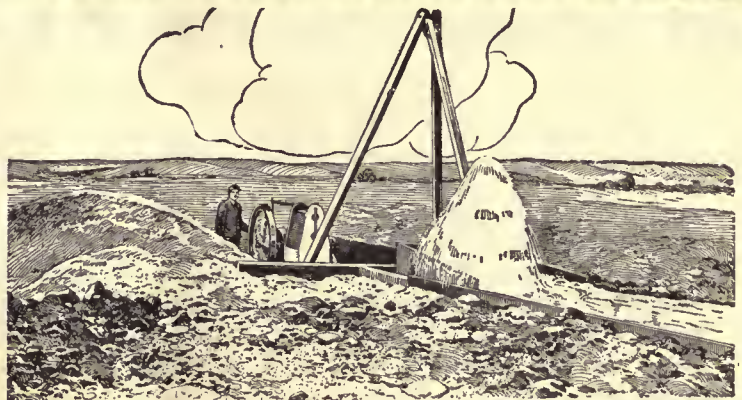
used in these little experiments. One salt, almost before you are ready, crystallizes into a brilliantly colored, sword-shaped form that darts quickly across the field. Others follow but they never bump into each other. They always stop nearby, and buds or branches begin at once to shoot out from their sides. Soon the whole solution is visible in a delicately woven, gorgeously tinted, beautifully spun design of some royal goldsmith's creation. They grow and grow in breadth, depth, and width, but remain in perfect proportions of naturally carved and many colored filigree work.

Any amateur chemist may go beyond the microscopic size of these little crystals, and produce vertiable Gargantuan examples. If chromate of iron or cobalt salts are dissolved in pure water and placed in a dark place for some hours, beautiful garnet crystals with jewel like facets will be born in the mother liquor, and daughter crystals will be seen budding and growing from the larger ones. These may become so large that they can be exhibited in a show case. It requires no great chemical skill to obtain them. Let any boy or girl that dabbles in elementary chemistry try this, and the reward of success will quickly crown your efforts.

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INDEPENDENT irrigating systems, when properly operated, prove true to their title—they make you independent of rain or other uncertain sources of supply. Almost without exception they prove the cheapest and most satisfactory. If you are able to secure a sufficient supply of water by sinking wells, or from a lake or stream, you should start today to lay out a good irrigating system. Dependable power is easy to obtain. An



I H C Oil and Gas Engine

will take care of the pumping and will also furnish power to run any farm machine. It will require no watching except to keep it properly oiled. It is the cheapest and most dependable power you can secure.

I H C engines are built in many styles—vertical, horizontal, portable, skidded, air-cooled, water-cooled; in sizes from 1 to 50-horse power. They operate on gas, gasoline, naphtha, kerosene, distillate, alcohol.

I H C tractors are built in sizes from 12 to 60-horse power. There are also spraying, pumping, hay baling, wood-sawing, outfits, etc.



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Get our interesting irrigation catalogue from the I H C local dealer, or, write the nearest branch house for a copy.



The field is unlimited and uncrowded; marketing the product in competition with the clay interests and at clay tile prices produces a great profit and a glance at the future spells only success for the factory or business started today.

No existing proposition offers such flattering inducements or such a field of opportunity for the man looking for a vocation or for the man looking for an investment. No other business can net you such profits on the amount of capital involved, and no other business has such an unlimited future.

Just think of a business paying from 30% to 50% on the investment the very first season, and subsequently from 50% to 150%, then ask yourself the question—Is it worthy of investigation?

Our literature gives you all the details regarding the merits of cement tile, the cost of manufacture, the amount of capital required to embark in the business; how to build your factory and last, but not least, it tells you how we aid the manufacturer using our machinery and gives you our full and complete proposition. A short letter telling that you are interested will bring complete data.

The Cement Tile Machinery Co.

172 Rath St., Waterloo, Iowa.



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One-Man Tractor Gang



Plowing 14 Inches Deep —saving moisture by forming deep reservoirs

¶ The Little Dutchman One-Man Tractor Gang saves time and power as well as moisture.

¶ The set-over hitch connects the gang directly to the tractor; permits the tractor to run on firm ground; leads the plows straight ahead; and obviates the use of carrying wheels under the operating platform, which lightens the draft.

¶ The levers are assisted by strong springs, and are conveniently placed for the operator.

¶ The plows can be coupled in units of one, two or three gangs, forming plows of four, eight or twelve bottoms.

¶ Wheels are equipped with dustproof boxes and hard oil cups.

¶ All moldboards and shares are made of Acme Soft Center Steel, which don't break.

¶ The Little Dutchman One-Man Tractor is built in two styles, Regular and Deep Furrow. Both styles are furnished with either plain or friction break-beams. Both styles are also built with our new Automatic Power Lift.

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MOLINE PLOW CO.

Moline, Ill.



TO DESTROY WEEDS IN WALKS AND DRIVEWAYS

It is a rather tedious process and hard on tools to remove weeds or grass from walks by hoeing or cutting them out between the stones, but there are a number of chemicals or sprays which can be used with good success.

1. Salt. Take 1 lb. of salt to 1 gallon of water, boil and apply while still hot, or dry salt may be used and then watered in, but this will color the walk more or less and is not quite so effective.

2. Crude carbolic acid, $\frac{1}{2}$ oz. of the liquid to 1 gallon of water will also destroy ants.

3. Sulphuric acid. 4-5 oz. of the acid to 1 gallon of water. Best applied with a wooden pail.

4. Take 1 lb. of powdered arsenic to 3 gallons of cold water, boil and stir well. Then add 7 gallons of cold water with 2 lbs. of sal soda.

5. Lime and sulphur. 10 gallons of water, 20 lbs. of quicklime and 2 lbs. of flowers of sulphur are boiled in an iron vessel. After settling, the clear part is dipped off and used when needed.

There are also a number of commercial weed killers in the market which can be bought at seed stores. Applications of weed destroyers should best be made on a hot day or right after a rain, with a watering pot (sprinkler), and one good application is usually sufficient for the season. As the most of them contain poison, either arsenic or acids, great care should be exercised in handling them.

JULIUS ERDMAN.

Colorado Agricultural College, Fort Collins, Colo.

FOREST NOTES.

The forest service of India has demonstrated that teak wood grown in plantations is just as strong as that grown in natural forests.

Even the well-protected forests of Germany are by no means immune from fire, and the Prussian fire protection system makes use of lookout towers and telephones.

Much of the so-called silk nowadays is made of wood. Germany produces more than one million pounds of this cellulose silk, worth \$1,500,000. A ton of wood worth \$10 yields cellulose worth \$20, and this cellulose yields silk worth \$850.

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Earth Ditches are Costly and Wasteful
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Concrete Flumes are Perishable and Obstructive

All Three Waste Water—Time, Money, Land and Labor

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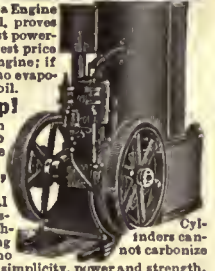
Amazing "DETROIT" Kerosene Engine shipped on 15 days' FREE Trial, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing. No waste, no evaporation; no explosion from coal oil.

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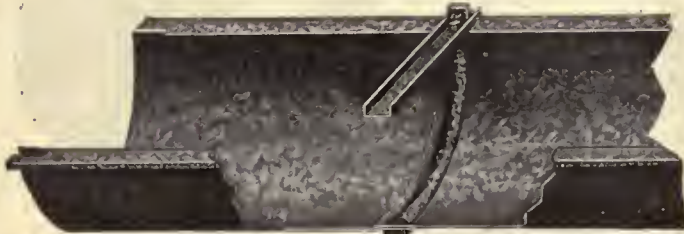
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Detroit Engine Works, 301 Bellevue Ave., Detroit, Mich.



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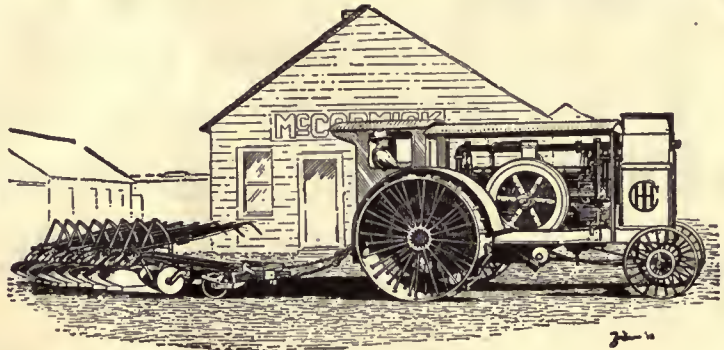
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WHEN you start your spring work this season—plowing, harrowing, rolling, seeding, etc.,—you can make your work easier, do it faster and better, and save money besides by putting an I H C tractor on the job. If your farm is small, buy a small tractor, 12, 15, 20, or perhaps 25-horse power; if large you can use a 25, 30, 45, or 60-horse power machine to advantage. An I H C tractor makes your work count. With it you can plow from two to ten times as much ground in the same time as with a horse plow. You can plow, harrow and roll at the same operation; you can draw two to four drills; at harvest time you can use it to draw the binders. It saves time and money in every operation. Make your work count.

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The I H C local dealer will give you catalogues of I H C tractors and engines, and will give you full information about the whole line, or you can secure it by writing the nearest branch house.

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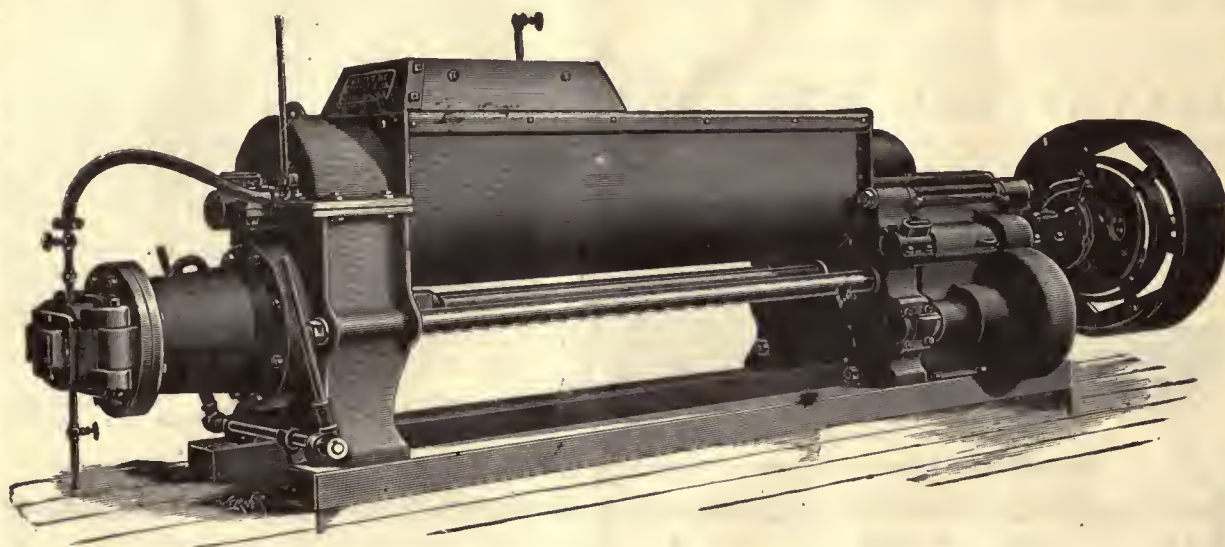
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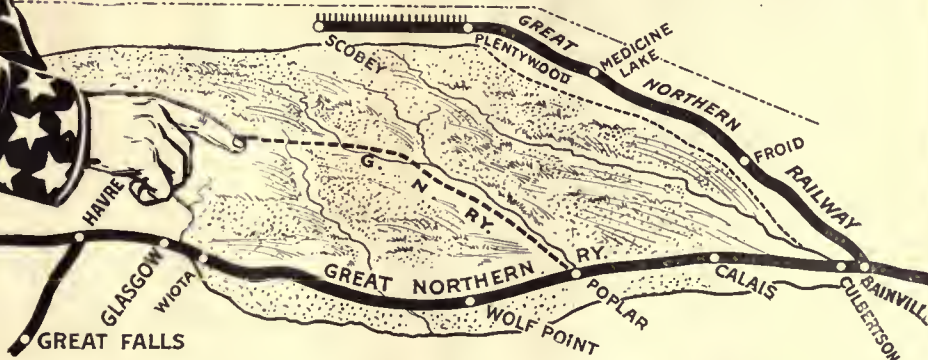
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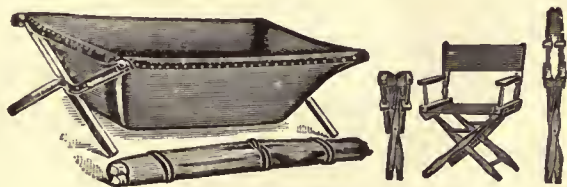


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The field is unlimited and uncrowded; marketing the product in competition with the clay interests and at clay tile prices produces a great profit and a glance at the future spells only success for the factory or business started today.

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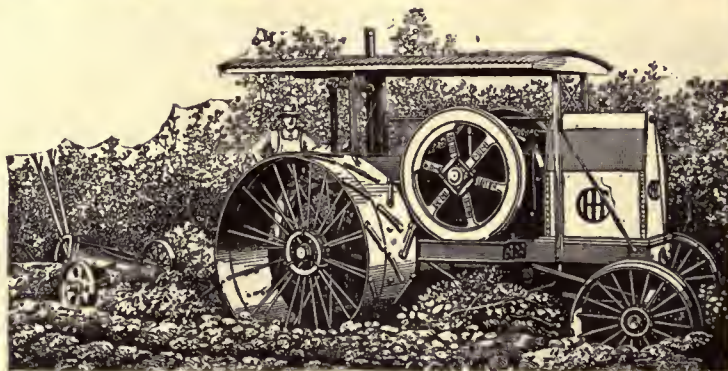
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We are prepared to make stock shipments from factory of this highly recommended and exceedingly popular irrigation pump, used for heads not exceeding over 50 feet. It belongs to the trade-marked "Buffalo" Class M family, which has won just recognition as the highest value obtainable in popular priced centrifugal pumps. The outfit includes pump, pulley, companion flanges and coupling for both suction and discharge, as shown. Only the finest white babbitt metal is used in the extra long bearings, which are furnished with brass compression grease cups. Thrust bearing is of ball bearing type. It may be installed by attaching the suction flange directly to the well casing, the pump itself being set between two vertical timbers, which also carry the shafting, bearings, etc., and is driven by pulley located above the ground at top of the well. Bearings, shaft collars, and steel shafting can be supplied at a slight extra cost to suit your individual requirements. Being accurately made and fitted, all parts of the pump are interchangeable and can be promptly duplicated at any time. Couplings are bored same size as shaft and bearings. Larger sizes also made. The price quoted is f. o. b. our factory.

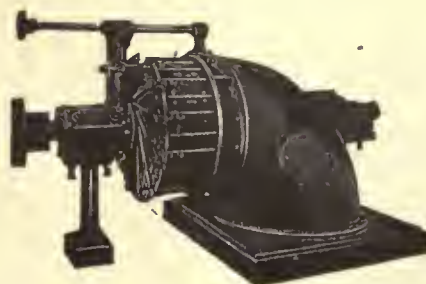
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Rural Road Grader and Ditcher



Cutting V-Bottom ditch on Slope of $1\frac{1}{2}$ to 1.

The successful irrigation ditch or lateral must be cut clean, with slopes smooth and undisturbed. This machine was especially designed to meet these requirements. One horse and wheel traveling in point of ditch, the other outside the bank of earth. Operated by one or two men and two or four horses.

If you have an irrigation problem to solve, do not fail to write for full information concerning this Combined Grader and Irrigation Ditcher.

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C. D. EDWARDS, Albert Lea, Minn.

This Book Shows How to Plan a Private Irrigation Pumping Plant



It also shows all of the various types of pumps to meet the conditions found in different localities, tells how to select the proper pump for your conditions, how to determine the amount of power you

will need and all the other things the irrigator needs to know.

One will be sent free on request as long as they last. Write today

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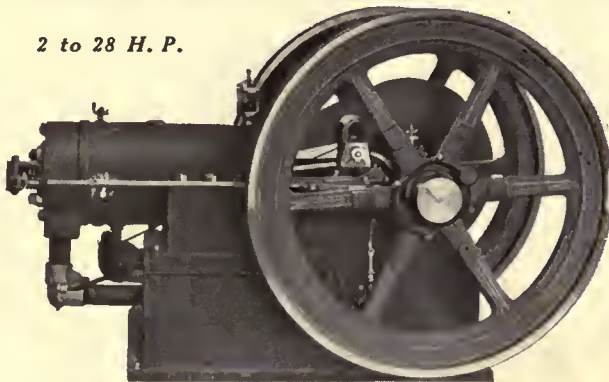
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THE IRRIGATION AGE

VOL. XXVIII

CHICAGO, SEPTEMBER, 1913.

No. 11

THE IRRIGATION AGE

With which is Merged

The National Land and Irrigation Journal

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD
THE IRRIGATOR

D. H. ANDERSON
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D. H. ANDERSON, Editor

ANNOUNCEMENT.

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Official organ of the American Irrigation Federation.
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Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 28 years old and is the pioneer publication of its class in the world.

Importance of Supplemental Irrigation.

It is very gratifying to learn through our press clippings that the people of Texas are awakening to the importance of supplemental irrigation; we will watch their efforts with considerable interest and advise the readers of *THE IRRIGATION AGE* as to the success of the undertaking.

Up-to-Date Methods of Irrigation.

Ex-Governor H. J. Hagerman, who is following the policy of water conservation and up-to-date methods of irrigation, has adopted the conduit system on a large scale, on his farm east of Roswell, New Mexico. A Los Angeles, California, concern has just completed the laying of 19,000 feet of this conduit system on the Hagerman ranch. Mr. Hagerman is quoted as saying that he is now getting double the service from the same amount of water than was obtainable under the old ditch system. The work of Governor Hagerman will be watched with interest by those who are studying the subject of the application of water.

John T. Bramhall Purchases Paper.

John T. Bramhall, well known in newspaper circles in Chicago, has recently purchased a half interest in "Alfalfa," a monthly paper published at Modesto, California, and will take editorial charge of the publication. Mr. Bramhall has had wide experience as an agricultural writer and student and will no doubt "make good" in this new venture.

Irrigation Age Will Assist.

Anent the National Irrigation Congress discussed by Mr. Bohm, in these columns, it may be well to say that *THE IRRIGATION AGE* is heartily in favor of the revival of that worthy institution and will use every effort to assist in bringing about conditions so that the Congress may be held in the year 1914. Those who are familiar with the situation fully understand that recent congresses have been top heavy with salaried individuals who have not been competent to handle the situation. A correction of this evil and an effort on the part of all of the members of the executive committee and other officials will no doubt result in bringing the Congress back to life and will make it stronger, if possible, than ever.

**Wadleigh
and Lomax
Receive
Promotion.**

Mr. F. A. Wadleigh has been advanced from general passenger agent of the Denver & Rio Grande Railway to the position of passenger traffic manager of the Denver & Rio Grande and Western Pacific Railways, and Mr. E. L. Lomax has been appointed assistant passenger traffic manager for both systems. The numerous friends of the gentlemen will be glad to learn of their advancement.

**Fort
Peck
Indian
Reservation.**

We are publishing in this issue an illustrated article on the Ft. Peck Indian Reservation, which will be thrown open for settlement September first. It is stated that there are over eight thousand farm holdings to be obtained on this reservation. This territory is traversed by the Great Northern Railway and that company is exploiting this project with the hope that with quick development that system may be largely benefited through the increased freight tonnage as a result of all of this land being put under cultivation. This is probably the last great land opening that will take place in the western country under government supervision, and our readers who are looking for opportunities should not fail to visit this tract between September 1st and 20th, when the entries are to close.

**Appoints
Supervisor
Over Farm
Work.**

Secretary Franklin K. Lane, of the Interior Department, has appointed I. D. O'Donnell, of Billings, Montana, to have charge of the reclamation work of the government in three great states. This is the result of careful thought and investigation on the part of the secretary. Mr. O'Donnell will have general supervision of the farm work in the states allotted to him and will be in a position to advise with the Secretary of the Interior as to what moves are necessary to better the condition of the farmers on various irrigated tracts in Montana, Idaho and North Dakota. The idea is a new one and whether it originated with the secretary or not is of no particular moment so long as the results obtained are beneficial to the farmer. The unanimous opinion of the people of these states is that Secretary Lane has not only acted wisely in appointing such a representative to look after the reclamation work in these states, but that he could not have made a better selection if he had considered the appointment for a year. Mr. O'Donnell is known as the alfalfa king of the Billings district and is a high grade farmer who will be able to look carefully into all of the needs of the settlers in the states named.

**Prior
Rights of
Artesian
Wells.**

Mrs. Fred Osborn, manager of the Varsity City Celery Company, Ann Arbor, Michigan, writes us and requests information concerning supreme court decisions as to the use of artesian wells and the abuse of the same, and wishes to know how flowage from these wells is apportioned to each and the right of appropriation; in other words, she would like to know how the appropriation is determined. Mrs. Osborn lives in a section where artesian water is used for supplemental irrigation and is desirous of learning what right people have who own flowing wells where the subterranean stream is tapped above them and the flow diminished thereby. If any of our readers have information on this subject, we will be glad to receive it from them so that we may publish it for the benefit not only of Mrs. Osborn but others who are similarly situated.

**Acres
Cost
of
Water.**

We are presenting elsewhere in this issue, an article by Mr. C. J. Blanchard, statistician of the United States Reclamation Service, regarding the cost of water per acre. The Reclamation Service is making a number of studies of relative costs of water under private and public projects and wherever these figures are available find that the cost of the government work is usually less than that of the private work executed with the same degree of care for insuring complete water supply as is done under the government works. The Reclamation Service is now trying to bring together actual costs of operation and maintenance under comparable works, but it is stated that it is very difficult to secure these because, while most of the private projects show a small expenditure for what they term "operation and maintenance," there is usually behind this a large expense account which, to be compared with the government figures, should be distributed to operation and maintenance. We hope to present further studies of this character which may be secured from Mr. Blanchard for future issues of THE IRRIGATION AGE.

**Lane
Talks
With
Farmers.**

Secretary Lane of the Interior Department, has been traveling through Montana recently as well as other western states and has made it a point to meet the farmers, and visit with them. He has been making inquiries concerning their condition and has promised radical reforms in operations under the Reclamation Service. He states that he wants to help the homesteader, the man with a family, who

is trying to build up Montana and other western states, and that he is unalterably against the speculator. At a big meeting held at Fairfield, Montana, Secretary Lane stated that if Congress listened to him, it would extend the time of the settlers for paying for their land, and he promised to send a man among them and reappraise some of the land and take certain lands admittedly not suited to irrigation, out of the project, thus readjusting the assessment and cutting a lot of dead weight from the shoulders of the people who are settled on the land. Secretary Lane is going about this in the right way and by getting in close touch with the settler, can learn more about actual conditions than he could obtain through a correspondence extending over many months. It is hoped that his visit will result in much good to the settlers throughout the western country.

**Revive
National
Irrigation
Congress**

We are presenting in this issue an article by Mr. Edward F. Bohm, member of the Executive and Congressional Committee of the National Irrigation Congress, on the subject of reviving the Congress

which failed to meet this year owing to the inability of the citizens of Phoenix, Arizona, to provide funds for the entertainment of that body. Mr. Bohm, who has been active in irrigation work for many years and who is the author of *The Carey Act Manual*, also the author of papers on Irrigation and Finance, has taken an active part in many of the recent congresses and is fully competent to judge of the possibilities for good in the meetings of that body. It has been stated frequently that westerners are not favorable to suggestions by people of the middle western states, but Mr. Bohm has seen a great deal more of western conditions than thousands of people who have spent their lifetime west of the 100th meridian. He has spent practically all of eight years in continuous study and travel, both as a government official and as a representative of *THE AGE* and in a private capacity, and has accomplished what few others could have done. He has abstracted irrigation and land laws of the 17 arid land states and has written several works on these subjects; consequently, when he contributes articles to these columns he is entitled at least to fair consideration by our thousands of readers in the west. Mr. Bohm will prepare for us for use in our October issue a general criticism of the conditions existing in some of the western states where companies have been organized and land developed under Carey Act, district and federal supervision. He will tell something about the conditions as they actually exist in the state of Idaho, where many abuses have

been permitted and where there is opportunity for great improvement in the line of irrigation development.

His article, which will appear in our October number, will be well worth reading.

**Will
Investigate
Irrigation
Projects.**

According to the biennial report of the State Engineer of Wyoming, 2,127 permits were issued in 1911 and 1912 which provides for the irrigation of 557,254 acres of land at an estimated cost of \$12,706,612. To reach this land it will be necessary to construct 3,349 miles of canal. The estimated average cost of reclaiming this land is therefore about \$22.80 per acre, or an increase of more than \$10.00 per acre over the cost for preceding years. It will be learned from this statement that large development is likely to go on in the State of Wyoming during the coming several years, and it may not be out of place to suggest that the State Board of Control should look carefully to the development, under the various permits which have been issued. Many stories come to us concerning affairs in Wyoming, which are to say the least, surprising. *THE IRRIGATION AGE*, after receipt of many complaints from people who have been misled in the purchase of land in that State, started an investigation of affairs and beginning with this, our September number, we present the views of one of those who invested money in the State of Wyoming, and who is at present sorry that he did so.* It is our intention to study carefully all of the various projects under way in Wyoming as well as some of those that are well established, and present facts concerning their development and method of handling people who have purchased land from the various organizations operating under Wyoming's laws.

THE IRRIGATION AGE will also present facts concerning the development of projects in other western states, notably Idaho. Many abuses have been permitted under the laws of that state as well as the state of Wyoming, and it was decided after due consideration, to secure the services of two able men, one for each state, who would present all of the facts to our readers so that they would be able to judge intelligently in any future transaction, in either one of these states. It must not be understood that we will confine our investigation to these states alone, as it is our intention to cover all of the various projects against which complaints have been lodged, and where the settlers have not been given a square deal. We will also attempt to show how eastern money has been solicited in the sale of bonds on

*The communication referred to will appear in our issue for October.—Editor.

various projects, in many instances having been secured under misrepresentation. It is the opinion of the editor of THE IRRIGATION AGE that the time has arrived when all the facts covering conditions of this character should be made public, so that a new start and a clean one, may be made along the line of irrigation development.

During this investigation, our representatives will study government projects as well and place before our readers many facts heretofore submerged by the red tape of bureaucrats having control at Washington and at the branch offices of the Reclamation Service. Very interesting and no doubt instructive information will be obtained from a perusal of these various articles prepared by our representatives.

THE IRRIGATION AGE hesitated for many years to expose crookedness in irrigation affairs fearing that by so doing it would bring into odium the better class of irrigation projects. As it now appears it would have been much better to have given all of the facts, several years ago, and in that way protect innocent purchasers whose money was put into worthless projects, under misrepresentation.

Our readers will do well to follow carefully this series of articles as a lot of valuable information will no doubt develop, and it will be worth while to watch for what is forthcoming.

**Chief
Reclamation
Counsel
King.**

Judge William R. King, of Portland, Oregon, former Judge of the Supreme Court and Chief Counsel of the Reclamation Service of the United States, has been visiting the various reclamation projects in Nebraska, Colorado and Nevada, and will look over those in other states prior to his return to Washington.

Judge King addressed a meeting of about 400 of the water users on the North Platte Project and in an interview stated that he had never talked before a more intelligent audience.

In a talk with the representative of a Denver paper he said:

"Settlers of reclamation projects have continually complained to the government that they are forced to pay too much in a short space of time. Under the present law all assessments for the maintenance of the projects must be paid in ten years. Senator Borah has introduced a bill extending the time from twenty to thirty years, and it is understood that the present administration will support the plan."

Speaking of reclamation work and the policy of the administration, he further stated:

"The government has invested between seventy and eighty million dollars in reclamation projects

in sixteen different states. All moneys received from the sale of public lands is being used in building up irrigation projects. Colorado has its share. You can say for me that the general policy of this administration will be to manage so that the test of success of an irrigation project will be measured by what is done by the man with limited means. We shall do everything in our power to extend the time for people who take the land, that they may meet their assessments for the building and maintenance of the project."

Judge King has had wide experience in irrigation affairs and has also had a fine opportunity to study the important features, through his practice as an attorney in eastern Oregon.

Much good will come to the Reclamation Service through his wise counsel.

CO-OPERATIVE FOREST FIRE PROTECTION.

During the last quarter of the fiscal year, the federal government entered into co-operative fire protection agreements with the following states: Maine, New York, Minnesota, Montana, Washington and Oregon. These six agreements contemplate the protection from fire of approximately 87,000,000 acres of land on the forested watersheds of navigable streams, for which purpose \$51,500 of federal funds have been made available. There are at the present time fourteen states which are engaged in active co-operation of this kind and it is possible that three new states—Kentucky, South Dakota and West Virginia will be added by early fall.

The Federal government, though it has allotted a total of \$85,000 for the work of the present season, is a minor contributor in the aggregate. Under the impetus given to fire protection of navigable watersheds through this arrangement the co-operating states will expend an aggregate of \$3 for every dollar which the Federal government spends, to which may be added about \$2 more from private sources.

These amounts, of course, do not represent the sum total of expenditures for fire protection even in these states. For in some of them the state itself is spending considerably more money in the protection of forested lands lying outside the watersheds of navigable streams. On the national forest, too, the government is spending several times the amount of its contribution to co-operative fire protection in the states which contain federal timberland.

Aside from these governmental agencies the railroads, lumber companies (both individually and through their co-operative protective associations) municipalities and private land owners throughout the country are growing more and more alive to the needs of better forest fire protection and are devoting each year an increased sum to this work.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics, add \$2.50 to above price.

**THE IRRIGATION CONGRESS—ITS OPPORTUNITY
AND RESPONSIBILITY.**

By Edward F. Bohm,
Author of The Carey Act Manual, Papers on Irrigation
Finance, Member Executive and Congressional
Committees National Irrigation Congress.

The text quoted below is a facsimile copy of a letter which I drafted and mailed to each member of the present Board of Governors of the Irrigation Congress, shortly after the adjournment of the last session, at Salt Lake City, in October, 1912. It con-

at the beneficial measures introduced in Texas, California and Oregon to observe the leaven at work. In these measures of reform the Congress as an active force for promoting legislative activity took no part. Its present board of governors is not to be censured for its lack of activity. Every one familiar with the affairs of the Congress knows that for months on end the location of its next meeting place and, consequently, of its sources of a full year's revenues "hung in the balance." When the



Flume of Yellowstone and Canyon Creek Co., Laurel, Mont.

The halftone, herewith shown, is from a photo showing an end section of a 9-foot diameter flume furnished by the Klauer Manufacturing Company, Dubuque, Iowa, to the Piper Construction Co., Billings, Montana, for the Yellowstone and Canyon Creek Ditch Company, near Laurel, Montana, along the Yellowstone River.

tains the essence of a paper I had prepared for presentation at that session but which, on account of the crowded state of the program, was not introduced. The statements as to the need of activity upon the part of the Congress are of as much force today as when first made almost a year ago, inasmuch as there has been no change for the better in the status of the irrigation industry. There has, however, been a great improvement in the attitude of a number of the western states towards the vital problems of water control. One has only to look

city of Phoenix finally delivered its decision, it was found impossible to interest any other communities in the subject—at least to the extent of offering it hospitality in 1913. Just why the Arizona city chose to reverse itself has never been made clear, officially—the writer has heard the explanation advanced, in confidence, by some of its best known citizens. According to these accounts, there were good grounds for their action, which could be criticized only on the ground of unwarrantable delay.

If there is to be a constructive policy in

connection with the Congress, if it survives, whether active efforts are to be made to rejuvenate it and to instill into it some of the spirit which made for its success prior to 1909, are questions it seems that are worthy of the best thought of every lover of the "West," and especially, at this time, of every member of the executive committee of the Congress. Personally, I would regret to see the extirpation of this once useful organization—for this reason: I am writing to the AGE in the hope that the publicity to be expected through its columns will result in a vigorous discussion—and let us hope further—in early vigorous action to extend to the Congress a new lease of life, upon a new, and vastly better, plane.

The Irrigation Congress—Its Opportunity and Responsibility.

The International Irrigation Congress (formerly the National Irrigation Congress) has accomplished much good in the past. It has been a potent force toward the upbuilding of the arid west. Its policies and aims have been broad while observing the line of demarcation between its field and that of other organized bodies. Attempts to merge it with other congresses have, so far, met with failure, and success in this direction, as viewed at present, seems improbable. Giving due weight and consideration to all that has been done, it must be admitted that much has been left undone as well. The fact is also incontrovertible that many of its recommendations and "Resolutions" have called forth adverse criticism—how well founded depends upon the individual point of view. Perhaps it is expecting too much to hope to conciliate all interests of a country of so vast a scope and embracing such widely divergent conditions. These remarks are not offered in a spirit of carping criticism, nor is it intended to hold any individual responsible for any real or fancied failure upon the part of the Congress, to measure up to its full standard. Nevertheless, the "veterans" of the Congress are not willing to credit the annual sessions held subsequently to 1909 with the spirit, the "verve" that inspired the gatherings prior to that date. The Congress of 1909 marked the inauguration, with largely augmented expense, of a new system—that of more or less centralized control. Great things were expected of the new order. It is a question whether, upon the whole, the system has justified itself. In some ways it has unquestionably proven a detriment—at least superficially so. This qualification is made, advisedly, since no mere item of organization expense should, or would, weigh heavily in the balance if measured against real results upon a grand, nationwide scale. The great expense incident to the entertaining of the annual "congresses" has operated to deter many cities from extending their hospitality to them. It has been demonstrated that the large centers care nothing about these events. In the last analysis the subject becomes one to be viewed from a strictly commercial standpoint—the business interests which are looked to to supply the sinews of war, cannot be expected to be governed by altruistic

motives. Too often, in the immediate past, has the best time, energy, and thought of the officers of the Congress been given to the harassing details of "raising money" when needed for better and higher purposes. To a very large extent, also, has the Congress been diverted from its serious purposes and been made a plaything in a very justifiable attempt, perhaps, to attract as large an attendance of visitors to the city as possible. Nor would this, in itself, be of serious moment, but this practice has had a very marked influence upon the deliberations and policies of the Congress. It has led to the injection, into its councils, of a very considerable percentage of "floaters" from year to year—random visitors from non-arid states, who, without previous knowledge, experience, or interest in the subjects to which the Congress is supposedly dedicated, have, in many instances, decided, by their votes upon committees, its attitude and its official personnel. The present board of governors comprises a number of able men—some of whom are not novices in the duties of their high offices. It is generally assumed that it stands committed to an "active policy." It is confronted, at this time, with grave duties and high responsibilities. There is no sincere well-wisher of the Congress or lover of the "West" who will not bid its members Godspeed, or who would refrain from assisting them to the extent of his abilities. It would appear as though—viewed from an impartial standpoint—a new financial policy must be inaugurated or the present expensive organization must be made to justify its costly existence. To accomplish either, or both, of these purposes is not impossible, but it will require courage enough to discard certain time-worn fetishes. The hopes of the sponsors of the idea of securing funds from "individual memberships" at \$5.00 per annum have not been realized—the number of such memberships, at the present time, being insignificant. No other plan besides the time-honored system of saddling all expense upon one city during the interregnum between annual meetings has ever been publicly broached. Whether a feasible plan can be evolved and consistently carried into practice is a question which is now engaging the best thought of the Congress. Considering its vast field of potential usefulness and benefit to the arid-land states and the minimum of expense attaching individually to the 16 or 17 arid-land states, a continuing appropriation of, say \$2,000.00 per annum, from each, might, if constitutionally unobjectionable, appear a happy solution of the difficulty. However, the expense and trouble necessary to secure such legislation might be great, although much of this work could be accomplished by voluntary effort in each state, if so disposed. Any and all efforts in this connection must, of necessity, be ably seconded by the central and permanent authority—the board of governors. A proposal to divert funds from the Reclamation Service towards sustaining the Congress would meet with serious objection upon the part of many who seem to feel that this course would vest the "service" with undue preponderancy. The Federal Congress has been liberal in its attitude towards the Congress upon several past occasions, but its largesse cannot be depended upon as a permanent source of contribution. Continuing subscriptions from va-

rious commercial forms of organizations—corporations selling water rights, Carey Act companies, irrigation districts, water users' association, and individuals might be secured in small amounts, but the outlook in this direction is not genuinely hopeful and this course is not without its side of serious objection.

The Congress and its governing board will have other matters besides finance to engage its attention—questions pressing for immediate solution—largely through remedial legislation by the states. The present era of paralysis in irrigation and immigration was precipitated in May, 1910. It had been foreseen and heralded by able thinkers and sincere-minded students for a number of years previously. The writer has before him papers predicting the cataclysm from the pens of no meaner authority than Director Newell of dates of 1908-1909—papers in a similar vein by two of the most eminent engineers in private practice in Colorado, the illuminating discussion of Irrigation Securities by C. M. Keys of March, 1910, and the reports of a number of state engineers ranging from 1909 to 1911—all of them "sounding a note" against the then prevalent flood of "paper" Irrigation Projects. The writer, himself, in 1911, contributed a series of "Papers on Irrigation Finance" to the "Financial World" of New York, much of it being a resume of personal observation fortified by that of well-known authorities.

The attitude of the Congress towards these vital questions has been lethargic. At Pueblo, in 1910, the subject of more effective control of Irrigation Projects was disposed of by a resolution authorizing the board of governors to appoint a commission to study the entire subject and to report to the next Congress. This commission, so far as any records show, was never called into being. The Congress of 1911 was brought to Chicago largely upon the representation that the questions of "Irrigation Finance" would be given prominence upon the program in the city of their greatest importance. The subject was disposed of in one paper by Mr. Norman E. Webster, Jr., largely devoted to the technique of irrigation accounting, although our speaker in a thoroughgoing manner, pointed out, again, some salient facts of vital import. We cannot refrain from culling a few excerpts by way of emphasis. "There are, today (1912), five or six million acres supplied with water but unirrigated for lack of settlers. In addition to these acres, there are fully ten million acres included in partially completed projects, the managers of which are looking forward, anxiously, to the time when the water will be in the canals and the settlers on the land. We naturally compare this total acreage to be opened up in the next seven or eight years, to the rate of settlement during the last decade. In ten years of good times we have added to this irrigated area of the west but 6,200,000 acres. In other words, to bring settlers to the fifteen million acres now ready, or to be ready, in the next seven or eight years, we will have to procure settlers about three times as fast as we have secured them in the past decade. The west must not place upon the industrious settler a greater burden than he can bear. Already the price of land under many of the irrigation enter-

prises is more than he can pay for. Raise it a little higher and he will stay at home. Only a little more inflation is needed in some districts to burst the bubble created by land owners. The rallying cry then will be "Back to the shops and the city." our speaker knew whereof he spoke and he did not stop here. He gave to the "Speculative Enterprise" its full meed of attention. The west, with all its marvelous resources and advantages of living, is confronted "by a condition not a theory." Conditions can be righted and restored to healthful equilibrium, but they cannot be depended to overcome their own inertia, unaided. The Irrigation Congress is the only organized body in a position to cope with the situation, and it is plainly "up to" that body to devote its energies to the most serious situation that has confronted the land and irrigation interests of the west during its entire evolution. At the Chicago Congress I, again, introduced a resolution of import similar to that of 1910, which was again carried, and which went further in that it authorized the board of governors to raise such sums as might be needed to carry on the work of the commission. This resolution met the same fate at the hands of the governing board as that adopted at Pueblo. At Salt Lake, resolutions favoring states' control of irrigation projects were adopted, but nothing was said of a commission—the authors of the former resolutions having, apparently, tired of their efforts. It was left for Mr. George Snow of Salt Lake City to point out, in an ably prepared paper, a line of procedure which seems to meet with the approbation of students generally and which follows, somewhat, the system adopted by California in 1911, relative to irrigation districts. The broad question is now, what shall the Congress do to become a potent militant force for good, instead of a mere forum for public discourse—for addresses many of which are not heard of again till embodied in some printed document. First, it must place itself in a position to devote continued, active, effort toward the work at hand. If, to accomplish this, it be necessary to strengthen its organization, let this be done. Continuity of efforts will go far, also, toward solving the vexed problem of finances. Second, it should pursue an active, far-reaching campaign to procure needed legislation to the end that irrigation enterprises and their securities be properly safeguarded. Third, it should act in the same manner to the end that the states make their "bureaus of immigration" official clearing houses for *real* information respecting all phases of land open to settlement, including the status of water rights. What does the average man know—or where can he find out—of the value of a water right in a new country? Fourth, let the Congress embark on a campaign of legitimate newspaper and magazine publicity, setting forth to the world at large what is being done to safeguard the interests of the inventor and intending settler. Reputable publications, generally, will not be adverse to the publication of such data, if not tainted with suspicion of "private gain." Lastly, the Congress, itself, or its permanent salaried officials should constitute themselves a bureau of information, a clearing house, so to say, of the irrigation interests of the country.

8,406 VIRGIN FARMS UNCLE SAM'S OFFER

Nearly 9,000 160-acre farm homes will be drawn by the "lucky ones" as the result of the throwing open of 1,345,000 acres of land upon the Ft. Peck Indian reservation in northeastern Montana. This is the last great land drawing Uncle Sam has to offer his people and one of the greatest in the history of government



Exhibit of Andrew Red Timber, at Indian Fair, Poplar, Mont.

land openings in point of fertility. Government agricultural experts estimate that when this vast stretch of virgin soil is tilled it will add about 25,000,000 bushels of grain annually to the production of the United States—enough to feed an entire nation.

The Interior Department is making extensive preparations to rush a big corps of clerks to Glasgow, Havre and Great Falls, Mont., which are to be the registration points. These land offices will be open September 1 and the work of filing for this land will then begin. The people will have a chance to continue filing until September 20.

The vastness of the area opened to white settlement is expected to make this one of the most alluring land openings ever presented to the people inasmuch as their opportunity to getting something in the drawings will be much better than in any previous land opening. For instance when the Coeur D'Alene, Flathead and Spokane land drawings were held last year a total of 90,000 people filed and drew for the lands in those three Indian reservations, the total area of which was about one-fourth of the area to be opened upon the Ft. Peck reservation. Government officials do not think that more than 75,000 people will file for the Ft. Peck land. Hence the chances of drawing a quarter section in the Ft. Peck reservation "lottery" are about four times as good as they have been in previous government land drawings. The actual value of this land is said by government agricultural experts to average about \$25 an acre. However, the government's appraisal for its opening to white settlement is only from \$2.50 to \$7 per acre, thus making real prizes for those who draw this land.

The drawing will take place in this way: The names of all who file for land will be placed in a big

box and the envelopes drawn out one by one and numbered, until enough envelopes are taken from the box to correspond with the number of quarter sections available—8,406. Those getting the early numbers will, of course, get first pick of the land, in rotation, according to the numbers drawn. Then actual settlement of the land will begin May 1, 1914. Settlement is the same as under the homestead law, except that the appraised valuation must be paid—from \$2.50 to \$7 per acre, at these terms: One-fifth of the total down at time of entry and the rest in five annual payments. The settler, however, has the option of taking advantage of the new three-year homestead law by paying for his land at the end of three years and thus proving up on it. This gives the man of small means a chance for his "white alley."

Half a dozen modern town-sites already have been located by the government at points along the main transcontinental line of the Great Northern Railway which runs through the Ft. Peck reservation for 100 miles.

FACTS ABOUT FT. PECK INDIAN RESERVATION WHICH IS TO OPEN FOR SETTLEMENT SEPT. 1, 1913.

President Wilson on August 5 issued a proclamation for the opening of Ft. Peck Indian Reservation in Eastern Montana. Filings will be made beginning September 1, 1913, and continue to September 20. The land will be open to actual settlement May 1, 1914. The registration places are Glasgow, Havre and Great Falls, Mont. The final drawing is to be at Glasgow, commencing September 23. The reservation is located in Sheridan and Valley counties.

The opening of Ft. Peck Reservation will mark the last big opening of agricultural land in the United



Ft. Peck Indian Agricultural School and Products They Raised for Fair at Poplar, Mont.

States. Six new towns will be started on this big land area.

The total acreage of the Ft. Peck Indian Reservation is 2,068,693.

Land allotted to the Indians is 723,693 acres.

Land remaining vacant or unoccupied is 1,345,000 acres.

Land now under cultivation is 3,800 acres. Last year there were only 1,500 acres under cultivation and the year before practically none.

It is estimated by agricultural experts that when

this land is cultivated by the white settlers it will add about 20,000,000 more bushels of grain to the nation's annual production.

Flax this year is running from 18 to 26 bushels per acre, wheat from 20 to 25 bushels per acre and oats 60 to 85 bushels per acre.

IT WILL GROW ENOUGH TO FEED A NATION.

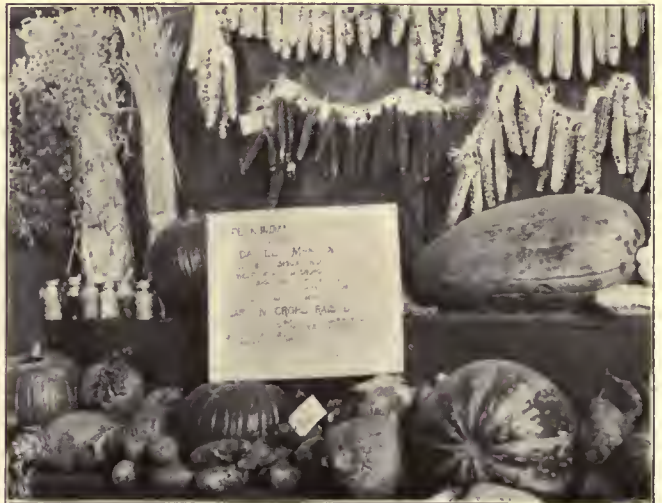
The total acreage of the reservation is 2,068,693. The land allotted to the Indians is 723,693 acres. The land that is thus left vacant is soon to be opened for settlement and covers 1,345,000 acres.

"On the supposition that the unoccupied lands were devoted to the growing of wheat on the summer fallow plan which would mean that one-half the area would be in crop at one time, and on the further supposition that the wheat would yield 25 bushels per acre, which is a moderate estimate for yields on land thus prepared, the aggregate production would be 19,312,500 bushels," Thomas Shaw, agricultural expert of the Great Northern Railway, estimates. Professor Shaw further says: "If this land were entirely devoted to the growing of barley on the summer fallow plan the yield would be 30,900,000 bushels as barley grown on such land should average 40 bushels to the acre. If the entire area were devoted to the growing of oats on the same lines the total production would be 38,625,000 bushels, as 50 bushels per acre would not be an extravagant estimate for land thus farmed."

"There is another way of showing the immensity of the possible production of this fertile tract of land. On the supposition that one-fourth of the entire acreage was devoted to the growing of fodder corn, the yield at the moderate estimate of $2\frac{1}{2}$ tons per acre of cured fodder would amount to 840,625 tons. If winter

one-tenth of the land were devoted to the growing of oats at 40 bushels per acre the yield would be 5,380,000 bushels. This would still leave one-fifth of the land for other kinds of production such as alfalfa, vegetables and pastures. The estimated possible production then would stand as follows. For each year after the first year:

Fodder corn	840,625 tons
Wheat	8,406,250 bu.
Flax	1,345,000 bu.
Barley	4,035,000 bu.
Oats	5,380,000 bu.



Prize Winning Exhibit of Daniel Martin at Indian Fair, Poplar, Mont.

"This would still leave ample room for other lines of production."

A striking era in the evolution of the American Indian was marked on the Ft. Peck Reservation in Montana October 1st, by the first County Fair ever held by Indians. At this unique agricultural exposition there were exhibited some unusual specimens of grain and grasses which later were entered at eastern land shows in competition with the prize products of the white man.

The white man has always laughed at the idea of civilizing the Indians, but the primer lesson in agriculture given the Sioux tribe has worked a remarkable transformation scene in the lives of these red men on the Ft. Peck Reservation. In 1911 Louis Hill, chairman of the Great Northern Railway Board of Directors, sent a representative body of these Indians from the Montana prairie to the New York Land Show. Inasmuch as the Indians were about to have their lands opened to the white man for settlement, Mr. Hill felt sorry for the crude children of nature and decided upon a novel experiment in their behalf. He figured that if these people were destined, without consent, to become farmers, they should be given some instruction in the agricultural methods of the whites. The Railway Chief thereupon picked the most intelligent members of the tribe and gained the approval of the Interior Department at Washington, to send them to the Gotham Land Show. The result was that the Indians went back to their Montana tepees imbued with the idea of tilling the soil and producing all of the wonderful products which they saw exhibited at the Madison Square Garden Show.

(Continued on page 353)



Exhibit of Mrs. Lone Dog at Indian Fair, Poplar, Mont.

wheat were drilled in the fodder at the proper season, which is August, and if the yield were the same as on the summer fallow, which would be reasonable to look for, the production in wheat would amount to 8,406,250 bushels. If one-tenth of the land were devoted to the growing of flax and the yield were 10 bushels per acre, the flax crop would amount to 1,345,000 bushels. If one-tenth of the land were also devoted to the growing of barley, putting the yield at 30 bushels per acre, which would be high enough for land not summer fallowed, the production would be 4,035,000 bushels. If

GAS ENGINES AND IRRIGATION

"What do you think of that forty?" asked a successful Colorado farmer of a visitor, pointing to a purple field of waist-high alfalfa.

"It's a beauty," was the answer.

"Well, I got that land for almost nothing because it was above the ditch."

"How did you do it?" asked the visitor.

"One of Ben Schmidt's Chilled Cylinder Engines. It's up there in that little shack, a $7\frac{1}{2}$ horse-power. When it's not pumping water I hire it out for all sorts of jobs. Last winter it more than paid for itself sawing wood and working for a contractor in a ditch camp, mixing concrete."

Think of the transformation that $7\frac{1}{2}$ horse-power engine worked. That pretty, gently sloping 40 acres was apparently just out of reach of the life-giving water. An ideal piece of land for irrigation. But for 20 years every one thought of it as "above the ditch."

Then the adjoining farmer got the big idea from one of Ben Schmidt's catalogues. He consulted the water company's engineer, bought in the land, and made his arrangements for water.

This is but one of the wonderful accomplishments of that famous Chilled Cylinder Engine, which is made by Ben Schmidt at Davenport, Iowa. All over the country these engines are busy, doing all kinds of work from serving as the motive power for automobiles and ferryboats, to operating hay presses and sawing outfits.

The writer has noticed in his trips through the west and middle west that it is the successful wide-awake farmers who are using gasoline engines. Curious to learn whether the engine was a sign of prosperity or one of its causes, he asked many of these gasoline users about it. Almost invariably it was found that the farmer had been materially assisted in his success by the engine.

A short time ago, while visiting Davenport, the writer remembered that here was built the Chilled Cylinder Engine which had transformed that Colorado 40 acres from buffalo grass to blooming alfalfa.

A visit to the factory was intensely interesting. The engine proved to be well named. It comes from the wonderful chilling process to which the cylinders are subjected.

The chilling process produces a dense, close grain in the steel on the inside of the cylinder and a more open porous grain toward the outer side. This serves a double purpose. The inside is hard, and, with its perfect lubrication never wears, while the porous nature of the outside assists in maintaining an even temperature.

Since Ben Schmidt invented this process there have been many attempts on the part of other engine manufacturers to secure the secret of the process for it has revolutionized the industry.

The process produces a cylinder that has caused mechanical experts to wonder at its remarkable efficiency. Every machinist working on those cylinders watches them as closely as though they were making fine watch movements. They seemed to be putting the full, vibrant enthusiasm of the great establishment into every engine. And if enthusiasm in the manufacture would run engines the Chilled

Cylinder would need no other fuel. "A perfect Chilled Cylinder makes a world-beating engine," is the slogan of the shops.

There is one step in the manufacture of the Chilled Cylinder Engine that deserves comment. That is the method of securing perfect compression. The expansion of metal by heat is one of the greatest troubles of the engine manufacturer. The usual boring process heats the steel so that when it cools an uneven bore is the result. Extreme care is taken by the machinists in the Schmidt shops to secure a perfect bore, and to insure perfect compression four piston rings are used instead of three. And every groove and oiling ring is machined accurately to within one-thousandth part of an inch.

One of the most interesting departments is the testing shops. Here every single engine is put under active working conditions for two or three days. A battery of engines is working at full power every day, and the miss of a single explosion results in an investigation.

Ben Schmidt stands back of every engine that goes out with a five-year guarantee, even going so far as to attach an additional guarantee by the biggest bank in Iowa. A visit to this testing shop shows that Ben Schmidt's guarantee must be earned by every single engine on its own merits.

The subject of fuel is one that has been bothering engine manufacturers for a long time. It is well known that there is more latent power in a gallon of kerosene than in an equal measure of gasoline. Comparative cheapness and its availability in every small country store make it the ideal fuel.

While the writer was in Davenport a series of exhaustive and interesting tests on a new kerosene attachment were in progress. Mr. Schmidt had been working on this attachment for years and the results were wonderful. He had it ready months before he announced it, for he wanted to make absolutely certain it was the peer of all kerosene carburetors before he permitted one to go out. The news of his great success traveled fast, and now thousands of the purchasers of his engines are attaching them to their engines.

Ben Schmidt is a great optimist. He believes in everybody. This is shown by his business methods. Ben does not hesitate to send his engines on trial to any American farmer, contractor or business man. He is an exponent of the square deal, and says he has always gotten a square deal from the other fellow. That's why he sends his engines out on trial before he sells them. He allows a prospective purchaser to try an engine out on his own place for 30 days.

It was an interesting visit to this model factory. I could not help thinking as I left that here was started the work that made possible the reclamation of the beautiful alfalfa forty in Colorado, and that every day engines went out to add to the prosperity of farmers in every section of the world.—(Advertisement.)

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.

WELL IRRIGATION IN ARIZONA

Arizona, "the desert," as described in the geographies is offering another strong evidence in rebuttal. This time it is the artesian well. When prospectors and soldiers died of thirst in Arizona in the pioneer days, nobody dreamed of artesian water beneath the sandy wastes. Even until recently, the idea of artesian water was scouted by the most enthusiastic Arizonians. But now it is an accomplished fact. It has been discovered in at least two sections and there are hopes of obtaining it in others.

The San Simon valley and the mesa country bordering the Gila valley are at present offering the evidence that Arizona is not all sand and mountains, with nothing to make it productive except the rivers at floodtime—"in the rainy season," as they say locally. A dozen artesian wells, all flowing, have been brought in by land owners in the San Simon valley and half a hundred have been developed on the Gila mesa, the table land skirting this beautiful valley which the Normans began to develop a decade ago, and which they and others are still developing into a high state of production.

In both the San Simon valley and on the Gila valley mesa, the discovery of artesian water was by merest accident. Nobody had the temerity to drill purposely for it. Drilling for water that might be pumped or for oil, the possibilities of which were strong, the wells were put down, but in either case, the result was worth more to the owner and the community than if success had attended the original effort.

In both valleys, the flowing water is being used for irrigation purposes and the yield as a result of the irrigation that is thus made possible, is enormous. The land, unused for centuries, appears to contain just the proper amount of humus to be productive, and, with a judicious use of the water, it has been producing abundant crops of vegetation susceptible to growth in the Arizona region. It has not been in use long enough to develop any fruit of consequence, but that fruit growing will be a success, there is no doubt, for patches of fruit, watered in the more expensive and more laborious methods of the well or the river ditch, have been growing in these regions for years and the yield has always been large, the fruit splendid in growth and always unusually palatable to the taste.

In the San Simon valley, there has been very little fruit growing, but enough on the scattered ranches to prove that it will grow. In the region about Safford, however, fruit is one of the staple shipping products of the farmers who settled here 25 years ago and have converted this valley into a bit of southern California by their careful cultivation and judicious distribution of the waters of the Gila river on the land that is low enough to be reached by the ditches. As the mesa land on which the artesian water had been discovered, is of the same character as that in the valley, the fortunate discovery of such water will bring into cultivation many thousand acres of very valuable soil. Much of it was free government land, on which homesteads have been taken since the discovery, thus making room for many new home owners, who will help to develop and bring the country into a higher state of civilization. Already the valley country is one of the best developed sections in the state of Arizona.

The first farming in the state was commenced in the Gila valley when a little band of Mormons migrated to this section from Utah. Ditches were constructed, first small, then community affairs, and gradually acre after acre was brought under cultivation—planted in garden truck, orchards and alfalfa.

Today, the towns of Solomonville, Thatcher, Safford and Pima are among the richest in proportion to population in the entire state. The communities in this valley are as if they were a little empire within themselves. Every man owns his home, all have fine stock, many automobiles are in use, and the best roads in Arizona are to be found connecting the valley settlements. Creameries, wheat mills, barley mills, saw mills—for there is a world of fine timber on the Graham mountains, which overlook the valley—and various industrial enterprises are a part of the community assets, and every town has its beautiful park, its tree-lined streets, its public hall, a good school and most of them have electric lights and good water systems. In Thatcher is located the stake academy, where the Mormon children are taught the higher branches of



AN ARTESIAN WELL AT SAN SIMON, ARIZ.

education. The stake temple, or place of worship, is also located there.

A trip through the community is a revelation. There is not a pauper in the community, and it is necessary to hire day laborers to work the lands of the Graham county poor farm, located at Safford. There is not a prisoner in the Graham county jail and the people of this valley boast that the jail doors have stood wide open since the creation of Greenlee county, which took the mining camps out of Graham county.

The roads have all been built of crushed, decomposed granite, and while they are not oiled, they are firm and solid and automobiles make sixty miles an hour without any inconvenience to the passengers. There are over a hundred automobiles in the valley and no anti-speed laws. The people drive as fast as they please when the road is clear and they always respect the rights of others when they meet another vehicle on the roadway.

It is claimed for the valley that the average value of each family's holdings are \$15,000 and that there are very few men who do not own a home in one of the towns or between the towns in the valley. It is the boast of the communities that they could exist forever if absolutely cut off from the rest of the world. While they have given up their pioneer habit of making their own cloth for their clothing, they have not lost the art and could grow cotton for this purpose, but they have quit, as six crops of alfalfa a year is better.

PROTECTING DRINKING WATER

Concrete Well Platforms are Conducive to Health

Even with an abundance of fresh air and wholesome food, the health of a country family is largely dependent on the purity of its drinking water. Since the principal source of farm water

of the well is of solid concrete (proportioned 1:2:4), or of blocks or bricks laid up with cement mortar mixed in the proportion of 1 part cement to $1\frac{1}{2}$ parts sand. Carry the curbing 6 or 8 inches above natural ground level and grade the turf to this height so that surface water will flow away from the well. Prepare to mold the cover on a wooden platform of two-inch boards laid over the

well or placed on a level spot of ground. For most wells, a platform 5 feet square by 4 inches thick is sufficiently strong. To provide for a manhole opening, build a bottomless box, of 1 by 6-inch boards, 5 inches deep, 2 feet square at the top and 18 inches square at the bottom—outside measurements. Another plan is to have a tinsmith make a round bottomless tin form 5 inches deep, 2 feet in diameter at the top and 18 inches at the bottom, after the pattern of a large bottomless dish-pan. To either manhole form attach a wooden block of the size and shape of the pump barrel or stock. Grease the manhole frame and set it on the wooden platform where the opening in the well cover is desired.

Proportion the concrete 1 bag of Portland cement to 2 cubic feet of sand and 4 cubic feet of crushed rock, or 1 bag of cement to 4 cubic feet of pit gravel. Have the concrete just wet enough to flush a little cement mortar when tamped into place. Over the entire wooden platform, except within the manhole frame, spread 1 inch of concrete. For reinforcing, immediately place on this concrete 5-foot lengths of $\frac{3}{8}$ -inch iron rods running in both directions (criss-cross) and spaced 9 inches apart. Bend the ends to a hook-shape. Strengthen the platform around the man-



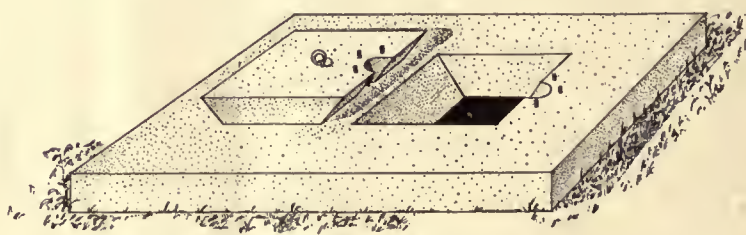
Sanitary Well Platform of Concrete.

supply is the bored or dug well, the purity of the water is determined almost entirely by the ability of the well curbing and cover to keep out contaminating surface water. If the well is curbed near the top with solid concrete (or with blocks or bricks laid in Portland-cement mortar) and is covered with a concrete platform, the healthfulness of the water is practically assured.

How to Make the Reinforced Platform

There are several methods of building a concrete well platform. The choice is dependent on the manner in which the pump barrel and stock are joined together. In the illustration is shown a platform 5 inches thick and 5 feet square, which contains a manhole fitted with a concrete lid. The pump stock passes through the platform by means of a circular hole at the side and a part of the manhole opening. By this means the pump stock and barrel can be joined together and slipped into position by a person working through the manhole. Afterwards the concrete manhole lid is set in place. Moreover this lid is heavy enough that it cannot be removed by a child.

In preparing the well for a concrete platform, see that 4 or 5 feet of the curbing near the top



Concrete Well Platform with Manhole Cover Removed.

hole opening by placing an additional rod on each side. Bring the cover to its full thickness at once by tamping in the remaining four inches of concrete. There will be needed 3 bags of cement, $\frac{1}{5}$ cubic yard of sand, $\frac{2}{5}$ cubic yard of rock and 6 pieces of $\frac{3}{8}$ -inch by 10-foot rods weighing 23 pounds.

For fixing the base of an iron pump securely to the finished well platform, place in the soft concrete

around the pump opening ordinary bolts (washer and heads down) to the depth of 4 inches. To locate these bolts correctly, set them by means of a wooden block or templet in which holes have been bored and spaced exactly like those in the pump base. Lag bolts or similar devices may also be used for this purpose. Finish the surface of the platform with a wooden float and steel trowel the same as for sidewalks. If the greased tin form is used, the manhole cover may be cast at the same time as the rest of the floor. Reinforce the lid with short lengths of iron rods laid criss-cross. As a lifting ring use half of an old bridle bit, or a hitching-post ring, the end of which is provided with a knob of twisted wire or with a nut and a large washer. If the wooden manhole form is used, carefully remove it after four hours. One day later build the manhole lid the same as for the tin form with this exception—place greased paper or card-board around the edges of the opening to prevent the new concrete from sticking to that of the platform. To make the manhole lid lighter in weight, before placing the concrete, spread $1\frac{1}{2}$ inches of wet sand over the wooden platform inside the manhole opening and then tamp in the concrete. Take care to place the reinforcing within one inch of the bottom of the manhole lid.

After the well platform is two weeks old, carefully remove the wooden boards on which it was built and set or lower it into place. Give the platform a slope of $\frac{1}{2}$ inch in the desired direction by placing a layer of cement-sand mortar between the well curbing and the platform.

Other Plans of Making the Platform.

Some persons prefer to make concrete well platforms in two pieces with the division line through the center of the pump opening. By this means the pump barrel and stock are easily joined and inspection is readily provided for. In other cases where the pump and stock can be joined together and lowered into the well as one piece, the concrete platform (removable) is made as a unit and with a single opening merely large enough to receive the pump stock.

Concrete well platforms built according to these methods can be depended on to protect the well from mice, vermin and scrub-water. In pure water there is health.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics, add \$2.50 to above price.

CORRESPONDENCE

Bowie, Arizona, August 8, 1913.

IRRIGATION AGE, Chicago, Ill.

Gentlemen: The Sam Simon Valley is a new—two year old—homestead proposition, and is making good progress, big developments going on and is truly a healthy infant.

There is now being promoted three big irrigation and power plants, by damming some of the large canyons in the Dos Cabazes and Chirichau mountains, south of Bowie. These will irrigate something like about 120,000 acres of this higher mesa around Bowie.

There is sufficient rainfall here during July, August and September, to raise a good dry farm crop, and with the building of the irrigation dams, giving supplemental irrigation, this land will raise in value from two to five hundred dollars an acre, for the lands are rich, and the climate healthful and a desirable place to live.

This irrigation project is being promoted by J. H. Jaque, G. B. Rentchler and Elza Craig, all of Bowie, Arizona, who are negotiating with eastern capital to carry the matter through to a successful issue.

Yours very truly,

J. H. JAQUE,
Secty. Bowie Commercial Club.

Idaho Falls, Ida., July 27, 1913.

THE IRRIGATION AGE, Chicago, Ill.

Dear Sir: Enclosed please find \$1 for subscription of your paper, THE IRRIGATION AGE. A man gave one copy to me. I not only read, but studied same and found it excellent. I also wish a copy of "The Primer of Irrigation."

Respectfully, Yours for Irrigation,
JOHN BUELER.

Ann Arbor, Mich., Aug. 9, 1913.

Editor, THE IRRIGATION AGE, Chicago, Ill.

Sir: Please send me as per your offer on page 325, August issue of IRRIGATION AGE:

IRRIGATION AGE renewal.

The Primer of Irrigation.

The Primer of Hydraulics.

Enclosed find \$3.50, the price named, in ad. for same. Would appreciate it if you would publish some supreme court decisions as to the use of artesian wells and abuse of same and how flowage from same is apportioned out to each, and rights of appropriators determined. We live in a basin of this kind and use artesian wells for irrigation. We have appreciated your paper very much.

Yours respectfully,

MRS FRED OSBORN.

R. F. D. No. 6.

Washington, D. C., July 29, 1913.

Editor IRRIGATION AGE, Chicago.

On this, my sixth visit to Washington in the interest of parcel post, I find a condition which should interest every reader of your paper. The parcel post law contains a vital clause, proposed by the "Parcel Post Congressman," Representative Lewis of Maryland, giving the Postmaster General power, by and with the consent of the Interstate Commerce Commission, to change the zones, the weight of parcels, the carrying charge, and all conditions of mailability. Acting upon urgent requests from all over the country, Postmaster General Burleson, after most careful study, with the permission of the Interstate Commerce Commission, announced that on and after August 15, 1913, the postal service will accept parcels weighing up to 20 pounds as follows:

On rural routes only, at a charge of 5c for the first pound, and $\frac{1}{2}$ c for each additional pound, or fraction thereof. The first zone is increased to 150 miles, airline, from the receiving postoffice; and the carrying rate reduced to 5c for the first pound and 1c for each additional pound. When this ruling goes into effect a farmer can send a 20-pound package for 15c to his postoffice, or to any person on his own rural route; or 20 pounds to any postoffice within 150 miles for 24c. Thus, the weight is almost doubled and the rate cut about in half. Thereafter, ordinary postage stamps are to be

used, instead of the special stamps now employed. These changes will make the parcel post service ten times more valuable than now.

But there is no peace in this world. Already there are rumblings and grumbings here in Washington, in all probability originating with the express companies, and possibly with the railroads. It is proposed to take away from the Postmaster General the power to improve the parcel post service, even with the consent of the Interstate Commerce Commission. But is not this delegation of power as now expressed in the law, just what it should be? How can Congress, which each session is called on to consider about 40,000 bills, ever attend to all the details of our great postal system, which so vitally affects every citizen? It will be time enough to limit the powers of the Postmaster General when it shall have been found that he is working against the wishes and needs of the people in postal matters—till then, by all means let the present law stand.

To head off this sinister purpose, and thereby save parcel post, each and every farmer should at once write a brief, courteous letter to his two senators and his representative in Washington, urging them to leave the present law alone and stand by Postmaster General Burleson in his effort to improve the parcel post service. Now is the time to tell your congressman how valuable the parcel post system already is, and how much you approve the proposed changes. Write and mail these letters at once, for there are forces at work the aim of which is to tie the hands of the Postmaster General and once for all destroy the efficiency of the parcel post system.

Do you want a still better parcel post? Speak out now, and speak plain.

W. A. HENRY,
Emeritus Professor of Agriculture,
Formerly Dean, College of Agriculture,
University of Wisconsin.

Present address:

Blue Hills Farm, Wallingford, Conn.

3,779,041 TREES IMPORTED.

Over Seven Tons of Tree Seeds Bought from Europe This Year.

Figures gathered by the federal quarantine board of the Department of Agriculture show that during the past fiscal year 3,779,041 growing trees and 15,040 pounds of tree seeds were imported into the United States. The trees include, say the members of the board, valuable species that do not grow in the United States and stock which can at present be bought more cheaply abroad. The tree seeds imported are largely for the purpose of reforesting land, though in a number of cases they are used in ornamental planting on individual estates.

France leads in the number of growing trees sent here, with a total of 1,782,255. Germany is second, with 849,245, and Holland third, with 690,632. Imports are made from 13 other countries, including India, Japan and Australia.

The trees and shrubs imported are chiefly evergreens, such as pines, spruces, and firs, and broadleaf plants—oaks, maples, etc. The majority is stock of foreign origin, though in a few cases cultivators abroad through a special selection of attractive forms of our native trees have developed them to such an extent as to make them desirable to purchasers here.

Besides more than seven tons of tree seeds, many thousands of pounds of seed of perennial and annual plants, bulbs, and fruit stock, as well as ornamental shrubs, are imported. The greater part of the tree seeds, or more than 7,000 pounds, come from Germany.

THE VALUE OF PEANUT BUTTER AS A FOOD.

By Dr. Leonard Keene Hirshberg, A. B., M. A.,
M. D. (Johns Hopkins).

The Department of Agriculture makes an official statement in reference to peanut butter.

The growing popularity of peanut butter as a food has led to many inquiries regarding the methods employed in its manufacture. Peanut butter is in reality a very simple preparation consisting merely of fresh roasted peanuts ground finely and salted to suit the taste. Several large factories and a large number of smaller ones are now devoted to the manufacture of this product with which to supply the rapidly increasing demand. Some of the larger factories are almost models in their construction, equipment and management, while many of the smaller establishments, which have no elaborate equipment are turning out an excellent product.

Peanut butter was first manufactured and offered for sale as a food for invalids, but the article was soon adopted by many persons, who, for one reason or another, such as preference for vegetable foods only, objected to the use of ordinary dairy butter. It soon outgrew this condition of limited use, and its development on a commercial scale has been a general product. It was never intended that this product should be used as a substitute for or a competitor of butter, but as a luncheon delicacy and to add variety to the diet. Peanut butter is a wholesome and nutritious food product, and has become a popular article upon our markets. Last year one manufacturer used over 130 cars of shelled peanuts in the production of 6,000,000 small jars of this food. Other manufacturers used large quantities, the total consumption of peanuts for the manufacture of peanut butter alone amounting during the year 1911 to approximately 1,000 cars of shelled goods, or 1,000,000 bushels.

In order to produce high class peanut butter the manufacturer must employ the best materials. On the other hand, the use of the best stock obtainable will be of little avail unless the work of converting into a salable product is conducted in a sanitary manner.

Peanut butter was originated by George A. Bayle, of St. Louis, about fifteen years ago. At first it was considered a novel fad for vegetarians only, but in a comparatively short time it has become an every-day need for all the people. Today many millions of pounds of peanuts are required for its production. Peanut Butter, usually sold by retail grocers, is undoubtedly pure, elegant and wholesome, and a decidedly better and cheaper food, for young and old, than poor butter.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of THE PRIMER OF HYDRAULICS add \$2.50 to above price.

Reclamation Notes

ARIZONA.

Engineer F. W. Hanna, formerly project engineer of The Boise project, but later in the department at Washington, was selected as confidential examiner of reclamation projects by George B. French, one of the commissioners named by Secretary of the Interior Lane. Engineer Hanna has recently completed a thorough examination of the Roosevelt project in Arizona and left for Washington with his report recently. Before leaving Phoenix, Mr. Hanna expressed himself as exceedingly pleased with what he had seen and especially delighted with the condition of the valley. It is the gem valley of the whole number that have been the subject of the work of the Reclamation Service, he stated to a newspaper reporter. Judging from other comments by Mr. Hanna it is presumed that his report will be exceedingly favorable, although he could take a lesson from some of the other government officials who have recently talked too much, and confine his opinion to his report rather perhaps than give it to the newspapers in the Salt River Valley prior to its publication by the department at Washington.

Charles Whitback of the legal department of the United States Reclamation Service, recently on a visit to Phoenix, Ariz., stated that a big lawsuit will soon define the water rights on the Gila plain. The main parties, numbering three, are now strengthening their positions for the battle. If the lawsuit comes the United States will certainly step in and demand the Indians' rights. The other parties are the water users of the Florence region.

CALIFORNIA.

Irrigation decisions rendered in the Fresno Superior Court years ago will go into effect soon and the Kings County Canal will be entitled to 200 cubic feet of water per second out of the Kings River while the Fresno Canal & Irrigation Company will be entitled to the remainder. By this ruling irrigators on the Fresno side of the river will be greatly benefited, as recently there was 1,250 cubic feet of water flowing in the river. Of this amount Kings Canal received 250 cubic feet, while the Fresno Canal received the balance of 900 cubic feet.

Judge J. W. Witten, a government official of the land department, has been at El Centre to investigate best ways and means to open 120,000 acres of land withdrawn in 1908. The land has been in demand by hundreds offering applications but they have been rejected on the grounds that the land was not open to entry. These claimants hope to have a new plan adopted to give them prior rights to the land.

During the fiscal year ending July 1, 1913, the sum of \$1,055,106 has been spent in reclama-

tion work in Yolo County, California. This is by far the largest amount spent on reclaiming land in the history of that section of the country. The annual report of County Auditor R. P. Wallace, from which the above information was obtained, shows that the proceeds of the sale of reclamation bonds amounted to \$999,000,035 during the fiscal year 1913-1914.

In a single day recently small farms valued at \$60,000 were sold to actual farmers in one of the big irrigated land projects of the Sacramento Valley (California). This is an indication of the results that must come to that State from the development of the vast area of valley lands lying along the big rivers.

The people of Livingston and vicinity endorsed the irrigation district plan at a meeting held in that town recently; this meeting was attended by scores of residents of Livingston and farmers and water users in the vicinity.

W. Hanson has been irrigating his corn crop on the river bottom near Glenn. It is perhaps the first time in the history of Glenn County, California, that the corn crop on the river bottom had to be irrigated to be assured. The river bottom soil heretofore has always carried enough moisture to mature late crops of all kinds.

The great need of the irrigated West today is not more projects but settlers for the projects that are completed or will be completed within the next few years, says the Fresno (Cal.) Republican. The period from 1899 to 1909 shows that there were more than 6,000,000 acres brought under irrigation, yet making a liberal allowance for the lands that will probably never be profitably irrigated, the enterprises on July 1, 1910, were able to supply water to more than half as much more land, and if the next ten years is to see two-thirds of the area in projects not irrigated in 1909, 12,000,000 acres must be settled and irrigated.

What is declared to be one of the most complete and economical irrigation systems ever installed in southern California is now nearing completion at North Whittier Heights—the Citrus and Sub-Tropical Orchard Land Subdivision, about two miles northeast of Whittier, which is noted as having the most valuable and profitable citrus groves in all the world. The source of water for the system is from a 12-inch well which has been sunk to a depth of 836 feet, and in which the water rises within 6 feet of the surface.

The first steps towards the formation of the new irrigation district near Oroville, Butte County, were taken at a meeting of the chamber of commerce held in that city recently. It was decided that a mass meeting of those who will have their lands watered by the system shall be held there late in August.

Eleven thousand acres will be reclaimed in Solano County, near Suisun, Cal.

COLORADO.

A step was taken recently toward the reorganization of The LaPlatta Land & Irrigation Company and The LaPlatta Ditch & Reservoir Company, looking to completion of the irrigation project undertaken by the companies in southwestern Colorado.

Two parties in the employ of the United States Reclamation Service are now at work at the site of the new Taylor Park reclamation project, 33 miles north of Gunnison, Colo. One party is drilling for bed rock at the mouth of Taylor Canyon, where the dam is to be built. The reservoir when completed will be 10 miles in circumference and the dam in the narrow canyon will be 190 feet high and 300 feet wide. The reservoir when complete will furnish an adequate water supply for the entire season for all the territory irrigated through the Gunnison tunnel.

A Denver paper states that contracts will be signed in a few days between the State Land Board of Wyoming and the President of the Missouri, Oklahoma & Gulf Railroad for the building of the Wind River irrigation project, which will water 200,000 acres of land in Wyoming and which was originally planned by J. Sterling Morton and associates. It is a Carey Act project and will cost about \$10,000,000, and requires three years for completion.

Colorado has 2,100,000 acres of irrigated land now actually under cultivation and offers to the eastern farmer opportunity to settle there and to devote himself to agriculture with the absolute assurance of rich returns for his labor. Colorado's dry land section has brought many hundreds of settlers there in the past year but her irrigated land brings many thousands every year.

Discussing the Greeley Poudre irrigation project recently, D. A. Camfield, of Greeley, president of the company, who was in Denver in connection with that company's troubles, stated that the company is largely in debt and has been unable to take care of its obligations on account of the embarrassment brought about through the failure of Farson Sons & Co. to sell the bonds the proceeds from which were to be used in constructing the system in compliance with an agreement with the Greeley Poudre District. Mr. Camfield states that the failure of Farson Sons & Co. to sell the bonds was largely due to the existence of a suit of the State of Wyoming against the State of Colorado wherein a substantial part of the water supply contracted for by the company to be sold to the district was involved.

The chief of the field division of the United States Land Office found a farmer in northern Colorado last week while he was inspecting the North Sterling irrigation project who will earn enough gross income from his land the first year to pay the full cost of the land, which was \$4,000. The owner is a Russian and resides near the town of Iliff.

MONTANA.

Secretary of the Interior Lane has been a visitor in Montana for the past week or ten days and has been accompanied by officials of the State as well as the officials of the railways traversing that State. It is hoped that Secretary Lane was able to secure some definite information concerning the status of reclamation affairs in the Northwest from Louis Hill, with whom he traveled for some time through Montana.

Dr. R. H. Eel, secretary of the Commercial Club of Helena, Mont., is very much elated over the prospects for full irrigation of Prickly Pear Valley. Within the past week it is stated that in the neighborhood of 600 acres have been signed up by the various members of the committee that have been working, making a total of nearly 12,000 acres.

Secretary of the Interior Lane has made the announcement to the agriculturists of Montana of the appointment of I. D. O'Donnell of Billings as supervising farmer on all irrigation projects of the government in the Northwest. Mr. O'Donnell's appointment is effective at once and his jurisdiction extends from Belle Fourche, S. D., to Boise, Ida. Mr. O'Donnell has just spent four days going over the Sun River project to secure information to place before the Secretary.

The Daley-Seaman Company, Miles City, Mont., has organized for the manufacture and sale of an irrigation device for lifting water. The head office of the company is at Miles City and the plants for manufacturing will be located there. J. H. Daley and James Seaman, with Walter S. Seaman of Miles City, are the incorporators.

The unusual supply of water in the Beaver Head River, Montana, most of which is used for irrigation purposes, has made it unnecessary for the district court to appoint a water commissioner this year. The records show that there has been close to 50,000 inches of water decrease out of Beaver Head River from the Lima to the point of rock 16 miles below Dillon, and in low water time it keeps three commissioners busy measuring the flow into the irrigation ditches in order to give the older rights their preference over new ditches.

L. D. Borden, who had the contract for the extension of the Bitter Root Valley Irrigation Company's canal to the eight-mile district and who completed the work several weeks ago, has taken a contract near Butte, says the Stephenville Register.

F. H. Newell, director of the reclamation service, was asked recently by an Oregon newspaper to make a statement concerning an interview at Ontario, Ore., with L. W. Hill, charging extravagance and incompetence. Mr. Newell said that the statements attributed to junior Mr. Hill are too vague to attract much comment or extended denial. The reclamation service has just undergone an extensive investigation by the secretary without the loss of his confidence in its ability, or the quality of its work, consequently criticisms from other sources do not seem to affect Director Newell.

NEW MEXICO

The Mimbres Valley Alfalfa Farming Company have recently purchased 12 American pumps, ranging in capacity from 1,000 to 1,800 gallons per minute, all of the turbine type. They have also purchased another tractor, a 25-45 horsepower Rumley.

Assistant state engineer of Carroll, has been testing irrigation wells on the Miesse tract recently.

The heaviest rain in Mimbres Valley for five years fell about July 15th. The gage at the Southern Pacific station showed almost a two-inch rainfall, and the downpour was general, according to other reports from that county. The farmers were lucky in that the rain just followed the second cutting of alfalfa, which had been baled, marketed or stored.

Henry Jacobs, a former Iowa and Idaho farmer, after two years' experience in the Mimbres Valley, developing farming property, has begun to develop a third farm about seven miles west of Deming. He has 120 acres of this quarter section cleared and about half of it plowed, leveled and ready for water. He is sinking, by a novel method, an irrigation well which will deliver, when completed, 800 gallons of water per minute. He is sinking this well by means of a bucket pump, and is now down 81 feet, with a six-foot pit, and has a drilled hole in the bottom of the pit to a depth of 200 feet.

A report is in circulation that the famous La Cueva ranch properties in Moro county have been sold to a Chicago capitalist.

Much interest was manifested in Albuquerque recently when it became known that the Garcia, near that city, one of the finest garden tracts in that section, was to be placed on the market. The Garcia tract has been cultivated for years, and has water rights on one of the oldest canals.

The Weeks law of March 1, 1911, providing for the acquisition of lands in the Appalachians, provides that five per cent of moneys received from each national forest into which the lands acquired are divided, be turned over to the state for its public schools and roads. New Mexico and Arizona, besides the sums before mentioned, are entitled to approximately 11 per cent of the gross receipts of all national forests in those states in return for the state school sections within national forests. This provision is embodied in the act of June 20, 1910, authorizing the admission of the two new states.

OREGON.

There is more development in Malheur County in eastern Oregon than in almost any other portion of the State, said State Engineer John H. Lewis, who returned recently from a visit to that County; he investigated a number of irrigation projects and also looked into the water troubles on

Willow Creek which were quite serious earlier in the season.

It is estimated by Henry Waldo Cole, member of the Portland Realty Board, that 6,000,000 acres of irrigable land in Oregon, worth when in full productiveness more than \$1,000,000,000, practically will require all of the available surface flowing waters of the State, lying within the arid regions, to consummate the beneficent purpose of making all of these waste places productive.

Work will be continued by the United States Reclamation Service this summer at Benham Falls, 20 miles south of Bend, Ore., for the purpose of determining the practicability of constructing a big dam there for irrigation purposes.

The Curtis Stock and Grain Farm, situated across the Columbia River from The Dalles, Ore., was sold at sheriff's sale at Goldendale recently to satisfy a mortgage of \$66,656 given by the Citizens' Trust Company of Seattle to Mr. Curtis at the time the property was purchased from him for \$100,000, two years ago.

With \$155,000 available since the recent appropriation by Congress, The Modoc irrigation project on the Klamath Indian reservation will be pushed to completion. About \$20,000 has already been expended on the work and the plan for its completion has been improved.

The county commissioners of Klickitat County have granted the petition of 50 land owners in the Camas prairie section of the State of Washington, in western Klickitat, for the establishment of an irrigation district under the State law. The boundaries have been defined and an election ordered which will soon be held.

The United States Reclamation Service is using galvanized iron pipe to carry its laterals across country roads. The largest pipe of the kind ever used in the Klamath Falls country was placed there recently. The pipe is 5 feet in diameter and 90 feet long; it weighs 4 tons and required two flat cars for its transport.

UTAH.

That the farms and orchards of Millard County, Utah, in the neighborhood of Hinckley, will not become a part of the desert was the determination of an enthusiastic meeting in Hinckley recently, at which more than 100 farmers considered the advisability of draining the land of the alkali that has appeared during the last few years.

H. Bullen has filed suit in the district court at Logan, Utah, against the Logan-Northfield Irrigation Company to recover damages in the sum of \$500, and also to enjoin the company from further interference with his premises. The canal borders upon Mr. Bullen's property and he recently walled up the ditch with rock, which the canal people tore out, alleging that the stone was on their property.

The farmers of Utah are much ahead of California in the matter of adopting new reclamation ideas, according to R. A. Hart, supervisor of the United States Drainage Investigations. Mr. Hart has just completed an extensive investigation of the raisin land near Fresno, Cal., where over-irrigation has almost ruined the land. He is now engaged in making a report of the investigation and is planning to establish an experimental tract at Fresno, with the co-operation of the University of California.

A project to increase the water supply of the state of Utah by wells that will tap the underground flow is attracting considerable attention throughout that state now.

The farmers who were served with water for irrigation from the Davis and Weber County canal have been notified that it will probably be possible for them to take water from the laterals soon. The repairs to the canal, which was badly out of order, are about completed.

There will be no meeting of the National Irrigation Congress in the year 1913. This announcement was made a week ago, but it was not until recently that George A. Snow, chairman of the board of governors of the congress, made a definite announcement. At the meeting held in Salt Lake last year, Phoenix was designated as the next meeting place, but that city was unable to make the necessary guarantee.

The West Branch Irrigation Company, Clear Valley, Davis county, Utah, has been organized with a capital stock of \$4,000.

A special meeting of the Land Board of Utah was held June 18th and consideration was given the Buckhorn Reclamation project in Grand county. The plan contemplates the reclamation of more than half a million acres, and is one of the largest projects ever brought to the attention of the Land Board of that state.

A committee composed of Horace Sheley, L. C. Miller and George Austin were appointed recently by the Irrigation Committee of the Commercial Club of Salt Lake City to act as a publicity bureau for that committee. The new publicity bureau will attend to the work of distributing government reports on irrigation and drainage throughout the farming communities of the state of Utah.

KANSAS.

The contract for installing the largest irrigation plant on a single farm in Kansas will be let by the board of control August 15. The plant will be on the new state insane hospital farm near Larned and by next year there will be 600 acres which may be irrigated whenever artificial watering is necessary.

Artesian wells flowing the year around supply valley farms of Meade County, Kan., with sufficient water for irrigation. George Landes, formerly of Hutchinson, has a farm of 400 acres near Fowler

which has not a pump on the place. Two artesian wells—the real flowing kind—supply his place with water for every purpose without having to pump a drop.

The Hutchinson (Kan.) News states that a good demonstration of the value of intensive farming and irrigating in a practical way may be found at the truck garden of G. C. Curtis, located near that place. Mr. Curtis, with 8 acres, is making more real money and realizing more profits than the average farmer with a quarter section of land. This veteran gardener states that he has marketed a crop that figured out at the rate of \$1,700 per acre. The crop consisted of green onions and they brought a fancy price.

As an illustration of what irrigation will do for land in Kansas it is stated that 2 acres of cabbage planted near Wichita brought \$200 and that the land has now been planted to turnips since harvesting the cabbages. It is the opinion of the farmer that the turnips will produce at least that amount or nearly \$200 per acre for the season.

To prove the value of pumping irrigation, Carter Bros. of Wichita, Kan., have installed an experimental well; the pump is centrifugal with a 2½-inch enclosed propeller. The well is 40 feet deep with water rising to within 10 feet of the surface. It is believed that the outfit will insure a crop on a half section of land at a cost not to exceed \$175 per year.

The Kansas City Big Horn Irrigation Company, a \$750,000 Wyoming corporation, was recently granted a charter by the State of Kansas to do business in that State. The Kansas business will consist in selling stock to Kansas investors. James A. Flotner, with headquarters at Kansas City, Mo., is president of the company.

J. L. Cullom, who has charge of the Underwood farm east of Hutchinson, Kan., has sold the product of a half acre of land planted to potatoes for \$146. Mr. Cullom states that he could not have gotten anything like this money had it not been for the fact that the land was irrigated.

Edwin Yaggy, one of the most extensive and successful orchardists in Kansas, is a believer in irrigation. He says that nearly every year there comes a time, perhaps lasting only a few days, that if a man could have water, the crops would be secured. One year he had a crop of 50,000 bushels of apples, and believes that if he had been fixed to irrigate the orchard just at the critical time his crop would have been 100,000 bushels instead of 50,000. Mr. Yaggy has evidently been studying the subject of supplemental irrigation to good advantage.

Wichita, Kansas, has come forward for a bid for the National Irrigation Congress for 1913. This comes to us in the form of a dispatch dated Aug. 13th. The matter was presented to the president of the congress, Major Richard Young, of Salt

Lake City. He wrote subsequently to the Business Association of Wichita, asking if they wanted to entertain the congress at a meeting this fall. The plan is to hold this congress on the same date as that of the Trans-Mississippi Commercial Congress, October 22. Full information as to the final decision has not reached us.

The state board of irrigation has issued notices that bids will be received for the putting down of well, construction of reservoirs, furnishing, installing of windmills, engines, pumps and other necessary equipment for the installation of state irrigation plants in Wichita, Kane and Wallace counties.

It is reported that in the big orchards around Hutchinson, no trouble is found owing to dry weather, as people in that vicinity are getting their orchards wet by means of irrigation. Scores of gasoline engines are chugging away, lifting the water from the under-flow and sending it through ditches along to the roots of the trees.

The lands purchased by the state of Kansas, near Larned, for a new state hospital for the insane, are expected to supply enough farm products for all the state institutions, and that the cost bill for maintaining the commissaries of these institutions will be cut in two. A modern irrigation plant to provide water for the entire farm, and a modern canning factory to take care of the crops will be installed on the property.

The State Board of Irrigation of Kansas will try out test theories of irrigation in Ford county. A Mr. Hines, of Scott City, who recently visited Dodge City, talked on the plan of the board, with the idea of feeling out the sentiments of the farmers toward having the county give forty acres of land to the state for an experimental station. Windmill irrigation will solve the problem of moisture for western Kansas, in the opinion of Mr. Hines, who is urging the farmers to install as many individual pumping plants as possible.

One of the first big irrigation projects to be constructed in Hodgeman county is now completed on the Harrington ranch on Sawlog creek. A large cement dam was constructed across the creek, and gasoline engines are used to pump the water to the ditches. Though put into operation but recently, the plant has made crop prospects on the Harrington ranch better than any in that part of the county.

WASHINGTON.

Although Secretary of the Interior Lane has not authorized a statement as to his decision on furthering the work on the Sun River irrigation project, his remarks to the settlers at several public meetings indicate a favorable attitude.

Land within government reclamation projects cannot be assessed and therefor taxes do not have to be paid on them while the United States holds title, regardless of how valuable the development of the land. This according to the Spokesman Review of Spokane is enforcing the important ruling

that has just been laid down by Judge Frank S. Deidrick, of the federal court for the Idaho jurisdiction, and will have its influence not only on reclamation projects in Idaho but every State in the Union where the reclamation of land is being carried on by the Reclamation Service.

A new irrigation project of 5,000 acres near Bray's Landing, 25 miles up the Columbia River from Wenatchee, Wash., is now under development. H. S. Goodrich of Topeka, Kan., a capitalist with whom is largely the control of considerable Kansas money, is the promoter.

WYOMING.

That an investigation of the methods of financing The Laramie-Poudre Irrigation Company, which was organized in Denver six years ago, with a capitalization of \$375,000, will shortly be instituted was announced in western papers recently. The Laramie-Poudre Irrigation Company took over from The Greeley-Poudre Irrigation District its bond issue of \$5,100,000 on September 8, 1909. Of the total capitalization \$4,000,000 of the bonds were sold to the banking house of Farson Sons & Co., at 82½ cents.

The Big Wind River Land & Irrigation Company, capital stock \$3,000,000, was incorporated under the Wyoming laws recently, and immediately thereafter entered into a contract with the State Board of Land Control to take over the property of and complete the irrigation project of The Wyoming Central Irrigation Company. The new company is backed by the Franco-American interests, largely interested in Wyoming oil and represented by the firm of Day & Kennefick. Under its agreement with the State the Big Wind River Company must reclaim at least 200,000 acres of the ceded portion of the Wind River Indian reservation.

The Independent Irrigation Company, which proposes to complete an irrigation system in Park County, Wyoming, begun by the defunct Big Horn Basin Development Company, has deposited with Frank L. Huff a bond for \$50,000 to guarantee his performance of the contract under which the State will permit it to proceed with the work. Mr. Huff is Secretary of State. The project which the company proposes to complete is known as The Oregon Basin Project and is intended to reclaim 300,000 acres with water from the Shoshone River. The stock of The Independent Company to the amount of \$900,000 has been placed.

The large irrigation flume over the Laramie River on the Hart Ranch is completed and the structure will be inspected for acceptance soon. The new flume will reclaim considerable land which has been unfit heretofore for cultivation.

J. M. Cohan, a settler in the Wyoming Central Irrigation Company's "low line" ditch, will fight the company's attempt to foreclose on his place because he has failed to pay out on the water contract. He will allege that the company also has failed to keep its end of the contract. This case will be a test which will be watched with interest by other settlers.

TEXAS.

B. L. Womack, a large potato planter of Calhoun, Tex., is sinking two wells preparatory to irrigation. Owing to dry weather, which as a rule prevails in that district during August and September, it is almost impossible to raise a full crop of potatoes without irrigation. He has 35 acres in alfalfa which he will flood when not using the water for the potatoes. Mr. Womack is evidently a convert to supplemental irrigation and it is hoped that his efforts may prove successful.

On the claim that a failure of crops that San Benito, Hamilton County, Texas, in 1912, resulting from abnormal and unusual rainfall, and the failure of the farmers to procure a market for their 1912-1913 products, had resulted in bringing about conditions in the business of The San Benito Land & Water Company threatening insolvency, receivers were appointed for that Company recently, by Judge Waller T. Burns of the Federal Court at Houston.

T. S. Ellis, of Anahuac, Texas, Manager of The Lone Star Irrigation Company, visited Houston recently and reported that work on the dam which is being constructed across the neck of Turtle Bay, so that the farmers in the adjoining part of Chambers County may have plenty of fresh water for irrigation purposes, is progressing nicely. Work on the dam commenced June 28th, and although the contract states that the work shall be completed by the latter part of September, Mr. Ellis thinks it may take somewhat longer to entirely finish the work.

The Trans-Pecos Land & Irrigation Company, Arno, has been incorporated at Arno, Reeves County, with a capital of \$500,000. The purpose being to reclaim land for agriculture under irrigation.

MISCELLANEOUS

In view of the unusual requirements regarding operation and maintenance during the current year on various irrigation projects, the Secretary of the Interior has ordered that water users who are actually unable to pay such charges and who shall have failed to pay them by July 21, 1913, may be allowed to receive water after making an agreement in writing to make an additional and further payment of one cent per acre for each month which elapses in whole or in part from July 21, 1913, to the date of payment. Such additional charge shall be separately added to each portion of an installment for operation and maintenance remaining unpaid on and after July 21, 1913, that is to say, those who owe portions of installments for operation and maintenance for two years shall be required to add the amount of two cents per acre per month or fraction of a month.

The Secretary of the Interior has directed the Reclamation Service to execute contract with the Standard Underground Cable Company of Los Angeles, California, for furnishing copper wire for

the Minidoka irrigation project, Idaho. The contract amounts to \$14,056.66.

On Saturday, June 14, 1913, the Teel Irrigation District of Echo, Oregon, voted bonds in the amount of \$1,200,000 for the construction of necessary works to supply water for irrigation purposes. The district comprises 20,000 acres. The main features of construction will be a tunnel 12,341 feet long, a storage reservoir dam 105 feet high, 650 feet long on top and 200 feet on the bottom, a main canal 19 miles long, including 5 miles of flume, and ditching for distributing system of 54 miles, with all structures connected built of concrete. W. B. Hinkle is chief engineer, and J. Frank Spinning secretary.

The Secretary of the Interior has authorized the Reclamation Service to proceed with the plans for the construction of the sixth unit of the Umatilla irrigation project, Oregon, which is the 10,000 acre unit of the west extension, on condition that the Oregon Land & Water Co. will agree to a modification of its decree, to the effect that these lands may be sold in farm units to be fixed by the Secretary of the Interior, not exceeding those fixed for the Northern Pacific lands in the same project. The land owners and settlers must file water right applications, and the charges per acre will be fixed by the Secretary of the Interior.

On March 27, the Secretary of the Interior signed a contract with the State of Oregon providing for co-operation between the federal government and that state in the investigation of irrigation and power projects. Under the terms of the contract the secretary agrees to withdraw the necessary land, and the state engineer agrees to hold the necessary water for the irrigation of projects under investigation.

The first work to be taken up was the investigation of a project for storing waters of Upper Deschutes river and diverting it at some point between the town of Bend and Cline Falls. Active organization for field work was not begun until about the first of May, when a topographic party was put in the field to develop detail topography of the dam site and vicinity.

In a power survey and investigation of Deschutes river, made in 1911 by the U. S. Geological Survey in co-operation with the State of Oregon, it was developed that a dam between 65 and 70 feet high, immediately above Benham Falls, would store approximately 700,000 acre feet of water, something less than the estimated supply available from winter flow. From any point below Benham Falls it would be difficult to divert water from Deschutes river to any considerable body of land other than that already being served or in process of being served by the Central Oregon Irrigation Company, successors to the Deschutes Irrigation and Power Company, Carey Act corporations.

The apparently cheap storage referred to suggested that it might be feasible to divert this water to lands north of Crooked River and the Central Oregon Irrigation Company lands on the east side of the river, and the lands on the west side of the

river north of the Tumelo project, formerly called the Columbia Southern project, for the construction of which the state recently appropriated \$450,000. The constitutionality of this act was questioned, but the courts decided it was valid.

The topographic party has been followed by a drill party and three holes have been put down, the deepest of which is now 76 feet below water surface and has not yet reached bedrock. After continuing one hole to bedrock or limit of casing, the party will move about a mile further down the stream and a short distance above the falls.

The topographic party has been divided into two canal line parties, one on the east side of the river working from a diversion site near the town of Laidlow, and the other working on the west side from the same diversion site.

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(Continued from Page 341.)

"The figures are rather surprising to some people," said Mr. Hill, "for they show that since these Indians returned from the New York Land Show in 1911 there have been more than twice as many acres cultivated on the Ft. Peck Reservation as were planted theretofore. It simply goes to show that almost anybody will improve their conditions if they are given a helping hand in the right direction."

The Indians are highly elated over the progress they already have made in agriculture as the result of the stimulus which their chief gave to the tribe on returning from the big land show of the white man in New York. The entire tribe entered with great enthusiasm the first Indian County Fair ever held. It was held at Poplar, Mont., October 1st last.

In connection with the beginning of the fling next month there will be a big Indian gathering just outside the agency town to celebrate the event. The Sioux then will hold their tribal dances and go through their picturesque ceremonies for several days.

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It's a mighty big job—draining the Everglades, reclaiming the Louisiana Low Lands and irrigating those vast, dry plains of the extreme southwest. And it takes big, capable men to engineer these projects.

But the contractors who have undertaken this work are more than making good. And many of them owe a large part of their success to the

Buckeye Open Ditcher

They have found in the Buckeye a machine that completely outclasses hand labor from every standpoint. It does the work better, much faster and without any of the trouble or heavy expense incurred with a large gang of men.

The Buckeye Open Ditcher will cut its way with ease through the swampiest kind of ground and leave behind a straight, clean cut trench with a perfectly graded bottom and smooth, sloping sides. The broad apron tractions attached to the side of this machine enable it to travel over wet land without sticking or sinking in.

You can get a Buckeye that will cut a ditch 2½ foot top or one that will cut a ditch 12 foot top. Between these there are five other sizes so that we can easily furnish you with a machine that will fit your particular requirements.

Send for free catalog 26—today

THE BUCKEYE TRACTION DITCHER COMPANY

FINDLAY, OHIO

THIS SAVES YOU FIFTY CENTS.

Remit \$3.00 for one year's subscription to THE IRRIGATION AGE and one copy of the "Primer of Hydraulics," cloth bound.



The Brevoort

IRRIGATION DOES IT INTEREST YOU? If so, send for our SPECIAL FREE CIRCULAR, showing SAND PROOF STEAM IRRIGATING AND DRAINAGE PUMP. No Engine required with this pump

Sand on either outside or in cannot injure them. Will raise and force water, sand and gravel any distance required.

Saves fifty per cent of fuel.

Most economical irrigating and drainage pump to both install and operate now on the market. Will work submerged if required.

Has given 16 years of satisfaction to the largest concerns in America.

STANDARD MACHINERY CO., Fisher Bldg., Chicago, Ill.

Poultry Notes

It is a waste of food to keep young cockerels after they weigh five pounds to the pair, as they are sold as "old roosters" after their combs grow. While the market rate for old roosters is from five to nine cents a pound, young ones often sell at from 15 to 20 cents per pound. It is a loss to keep them longer than when they are old enough to sell.

One part of cedar oil and two parts of vaseline is an excellent treatment for sore head.

When hens become too fat the result is apt to be egg bound, soft and irregular shaped eggs, dizziness, apoplexy, liver complaint and kindred diseases.

It is claimed that nux vomica is a specific for liver complaint in fowls, if taken in time. The dose is given in Homeopathic form, allowing six pills three times a day to a large fowl, and less to a smaller one.

The following formula for roup pills is recommended: Half a dram each of cayenne pepper, ginger, mustard; half ounce of plain vaseline or clear lard; mix thoroughly and add enough flour to make a tough dough. Make into pills the size of a pea. Dose, one night and morning.

The following is said to be the recipe for making Vale's roup pills, a popular English remedy: Hydrastin, 2 grains; sulphate of iron (dried) and sulphate of copper, 3 grains of each; powdered capsicum, 12 grains; oil of copaiba, 20 drops; Venetian turpentine and calcined magnesia, of each enough to make 24 pills. Dose for adult fowls, one or two pills, night and morning.

Diseases of the liver are caused by overfeeding of fat-producing food or by the use of too much spice or stimulating substances. This particular trouble, is hypertrophy of the liver, which is an enlargement of that organ, and is often found in hens kept over the second winter. It is due to

feeding too much fatty food, combined with a lack of exercise. In the early stages the disease may be arrested by feeding lightly on bran mash and green food, and to each quart of drinking water

adding one-half teaspoonful of muriate of ammonia.

The trap nest is a regular detective. It tells the facts of the case: It takes the hens, it gives

BINDER

Attachment with Corn Harvester cuts and throws in piles on harvester or winrows. Man and horse cuts and shocks equal with a Corn Binder. Sold in every state. Price \$20.00. W. H. Buxton, of Johnstown, Ohio, writes: "The Harvester has proven all you claim for it; the Harvester saved me over \$25 in labor last year's corn cutting. I cut over 500 shocks; will make 4 bushels corn to a shock." Testimonials and catalog free, showing pictures of harvester. Address

NEW PROCESS MFG. CO., SALINA, KANSAS

CORN

HARVESTER with Binder Attachment cuts and throws in piles on harvester or winrow. Man and horse cuts and shocks equal with a corn Binder. Sold in every state. Price \$20.00. W. H. Buxton, of Johnstown, Ohio, writes: "The Harvester has proven all you claim for it; the Harvester saved me over \$25.00 in labor last year's corn cutting; I cut over 500 shocks; will make 4 bushels corn to a shock." Testimonials and catalog free, showing pictures of harvester. Address

NEW PROCESS MFG. CO., SALINA, KANSAS



Magnificent Steel Launch \$96

Complete with Engine. Ready to Run

15-20-25 and 27-ft. boats at proportionate prices. All launches tested and fitted with Detroit two-cycle reversible engines with speed controlling lever—simplest engine made—starts without cranking—has only 3 moving parts—anyone can run it. The Safe Launch—absolutely non-sinkable—needs no boathouse. All boats fitted with air-tight compartments—cannot sink, leak or rust. We are sole owners of the patents for the manufacture of rolled-steel, lock-seamed steel boats. Orders filled the day they are received. Boats shipped to every part of the world. Free Catalog. Steel Rowboats, \$20. MICHIGAN STEEL BOAT CO., 1323 Jefferson Ave., Detroit, Mich., U.S.A.

LOW FARES NORTHWEST



One-way Fall "Colonist" tickets on sale daily September 25 to October 10, to Western Montana, Idaho, Washington, Oregon, British Columbia. Round trip Homeseekers Tickets on sale every Tuesday to practically all points in the fertile Northwest. Two daily trains from Chicago, three from St. Paul, Minneapolis and Duluth, one from St. Louis, to the North Pacific Coast and intermediate territory. Two daily trains between St. Paul, Minneapolis and Winnipeg. Service that sets the pace.

Ask for free booklets, including Colonist folder and Homeseeker leaflet.

A. M. CLELAND, Gen. Pass. Agent
L. J. BRICKER, Gen. Immig. Agent
ST. PAUL, MINN.

**NORTHERN
PACIFIC RAILWAY**

Route of the
"Great Big Baked Potato"

accurate reports, it arrests the robber hens, it gives an honest count, and it exposes the fraudulent hens.

Some egg farmers candle all eggs each day as they are received from the nests. Their reason for so doing is to throw out all such that show blood clots—that is, every now and then a hen in straining to lay her egg is apt to rupture a minute blood vessel and this clot of blood sometimes shows itself inside the egg, and at other times we find the blood on the shell. When candling, this blood clot is seen if in the egg.

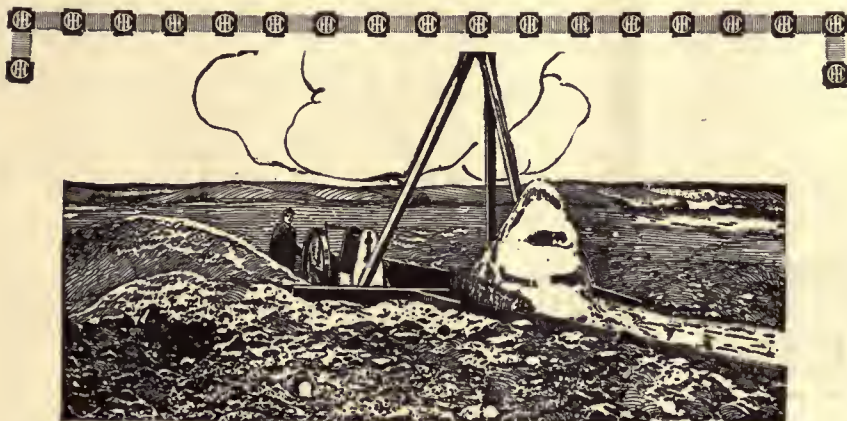
The Houdan is a small-boned fowl, having a thick breast, and the flesh is tender and juicy.

They make fine broilers and the best roasters.

Some poulterers, in order to obtain the best prices for their broilers hatch from October 1 to February 1 and have all the stock marketed by July 1.

The skin of the Langshan is a pure white, and not a dark or bluish white. The meat is fine-grained, tender and juicy; thin skin and small bone, and while possibly not so much admired in the market as the yellow-skinned breeds, none surpasses it for tenderness and flavor when served on the table.

Capon and poularde rearing is a general industry in Normandy, Maine and La Bresse (a capon



Here Is a Succession of Facts

TO eliminate drought you must have an irrigating plant; every farmer knows that's true. But to give the fields water when they thirst for it, you must have an engine that you can depend upon always to pump the water. The best engine for you is an

I H C Oil and Gas Engine

Every I H C engine that leaves the factory has been proved reliable. It would not have the I H C mark if it were not. It has passed thorough tests, is made dependable by correct building at the hands of skilled men, and durable by the use of only the best materials.

You can use the same engine for various power work about the farm. It is easily portable. The line includes all styles—horizontal or vertical; air, water, or hopper cooled; stationary, portable, or skidded; built to operate on gas, gasoline, naphtha, kerosene, distillate, or alcohol. Sizes range from 1 to 50-horse power. I H C oil tractors, ranging from 6-12 to 30-60-horse power, for plowing, hauling, shredding, etc.

There is profit for you in a visit to the I H C local dealer's. Learn all about the I H C line of engines—find out what one will do for you. Get catalogues from the dealer or write to the nearest branch house.

WESTERN BRANCH HOUSES: Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

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Any Size You Want

The Genuine

Chilled Cylinder Engine The Engine Sensation of 1913

The engine that, during the past few months, has revolutionized the engine industry. Pronounced by experts to be a marvel of reliability, simplicity and economy. Positively the only engine with the famous **Chilled Cylinder**, the strongest and most durable cylinder ever made. The best for farm, shop, and construction work. **The ideal engine for the irrigation farmer.** Combined with this cylinder is the **multiple compression**, secured by use of four piston rings instead of three, and the patented **Never-Falling Lubricating Device**. **These remarkable engines are fully guaranteed for five years.** Every engine undergoes the severest tests before it is shipped. It gives full power and more.

Kerosene Attachment Now Ready!

Wonderful new device for using kerosene and distillate. Cuts your fuel bill in half. Runs your engine on common, ordinary kerosene such as you can get in any store, or distillate. More powerful than gasoline. A tremendous advance. Send coupon today for description of this great cheap fuel attachment.

\$15.50 And You Keep This Great Engine

An offer absolutely unparalleled in the engine industry. The superiority of the Chilled Cylinder Engine enables us to make it to you. Only \$15.50 as a first payment—then the rest in **Easy Monthly Installments**. You get the factory price. No go-between profits to pay. You deal direct with the manufacturer, not with an agent whose only idea is to sell you an engine.

30 Days Free Trial

We want to send you this great engine for a free trial of 30 days. We want to prove to you that it is the peer of all engines. We want you to be thoroughly convinced. If you are not satisfied with its performance send it back at our expense.

Free Book "How to Use Power"

A valuable book on engines which contains information which every up-to-date farmer and shop owner should have. It comes to you absolutely free and prepaid. It is written so that anyone can understand it. This edition is limited.

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or write today to Ben Schmidt, president of the Schmidt Bros. Engine Works. Just send this coupon today and the Free Book will reach you by return mail.

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Dept. 3706
Davenport, Ia.

Name.....

Address.....

is a castrated male bird; a poularde is a female that has been operated upon). Poulardes are peculiar to the LaFleche and La Vans breeds. It is the peasant farmer who fattens the young hens and creates the industry.

The main reliance of the poultry breeder is the certainty that he will always have a fairly profitable market for his meat and eggs. This is the bedrock of the industry.

The late Morgan Bates once said that the class of poultrymen that are supplying the market with eggs and poultry, are the bulwark of the poultry industry of the nation.

Because there are failures with poultry is no argument that the business is a failure. There are lots of people who never make a success of anything they undertake. Work out your own salvation, and never mind what the croakers have to say.

A correspondent gives the fol-

lowing advice for trapping minks, skunks, weasles, etc.: Minks, weasles, skunks, etc., often visit the poultry house and in one night destroy from six to twenty fowls. The best way to capture minks is with a steel trap properly concealed and baited with a bird or fish. Minks travel several miles to get in a poultry yard or house. If there is a pond or stream near the house it is best to trap them along the place of their natural haunts. Take the fat from some fish and fry it out and pour it in a bottle. Leave the cork out and expose it until the oil decays and becomes very strong. A few drops of this placed upon any bait will attract a mink a long distance. Cover the trap with fine leaves or break up coarse leaves so that the jaws of the trap will not be filled up when it springs. If trapping the minks near the water it is best to set the traps under the water and make a fence with weeds so as to compel it to come out at the place where the trap is set.

White duck feathers average in

price in the market at from 37 to 39 cents per pound. Colored feathers bring from 17 to 23 cents per pound.

Indian Runner ducks are to the duck family, in egg production, what the Mediterranean class of fowls is to the chicken world. They are small ducks, averaging about four pounds in weight. English breeders claim that an Indian Runner duck at eight years old will lay as many eggs as a year-old duck of any other variety.

Send \$1.00 for
The Irrigation Age
one year and The
Primer of Irrigation
Paper Bound.

THE WINNER



THE machine that leads all eighth yard mixers for design, principle, cost of operation, convenience of operation, thorough of mix and low price. Get our catalog and learn *Why*.

The Cement Tile Machinery Co.
175 Rath Street, WATERLOO, IOWA

\$60 a Week and Expenses



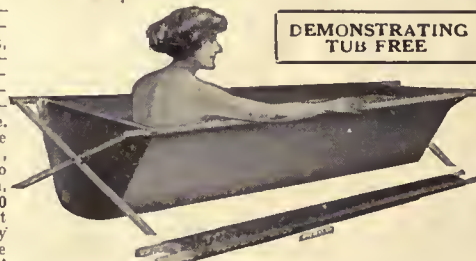
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YES, YOU
CAN GET IT**

That's the money you can get this year. I mean it. I want County Sales Managers quick, men or women who believe in the square deal, who will go into partnership with me. No capital or experience needed. My folding Bath Tub has taken the country by storm. Solves the bathing problem. No plumbing, no waterworks required. Full length bath in any room. Folds in small roll, handy as an umbrella. I tell you it's great! GREAT! Rivals \$100 bath room. Now listen! I want YOU to handle your county. I'll furnish demonstrating tub free. I'm positive—absolutely certain—you can get bigger money in a week with me than you ever made in a month before—I KNOW IT!

Two Sales a Day—\$300 a Month

That's what you get—every month. Needed in every home, badly wanted, eagerly bought. Modern bathing facilities for all the people. Take orders right and left. Quick sales, immense profits. Look at these men. Kunkle, Ohio, received \$240 first week; Mathias, Florida, \$120 in two days; Corrigan, New York, \$114 in 60 hours; Newton, California, \$30 in three days. You can do as well. **TWO SALES A DAY MEANS \$300 A MONTH.** The work is very easy, pleasant, permanent, fascinating. It means a business of your own.

I grant credit—
Furnish Sample—
Help you out,
Back you up—
Don't doubt—
Don't hesitate—
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You cannot lose.
My other men are
building homes,
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can you. Act then,
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MONEY.** Just
name on penny
postcard for free
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Little Dutchman



Power

Lift



One-Man Tractor Gang Raise and Lower the Bottoms By Simply Pulling a Rope

☞ Save power, time and moisture by using the Little Dutchman One-Man Tractor Gang with the Power Lift.

☞ The plow does the hard lifting. One man can easily handle the whole outfit. Plowing 14 inches deep saves moisture by forming deep reservoirs.

☞ Plows can be coupled in units of one, two or three gangs, forming plows of four, eight or twelve bottoms.

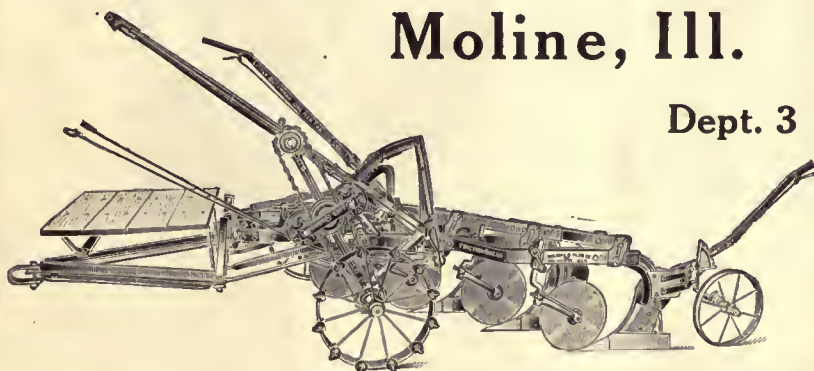
☞ Built in Regular or Deep Furrow styles, with either Plain or Friction Break-Beams.

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MOLINE PLOW CO.

Moline, Ill.

Dept. 3



CIVIL ENGINEER

With 5 years' experience in Southwest and Mexico, in irrigation work, wishes position with Irrigation Company. Can speak Spanish and handle laborers. 28 years old, married.

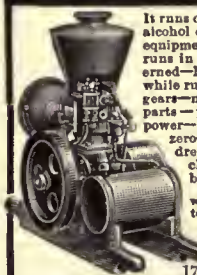
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Early reservation of berths desired.

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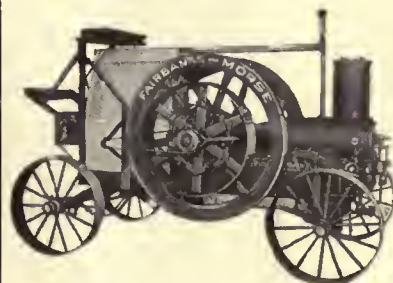
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All sizes. 5 to 25 H. P.

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DEGREES CONFERRED: B. A., B. S., PH. B.

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BOATING, HORSEBACK RIDING, SWIMMING, ARCHERY, GOLF and all outdoor athletics for girls under the constant supervision of a graduate of the Sargent School for Physical Education. School course comprises INTERMEDIATE, ACADEMIC and COLLEGIATE departments. Special courses in MUSIC, ART, LANGUAGES, DOMESTIC SCIENCE and DRAMATIC ART.

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Irrigation **KT** Systems

Earth Ditches are Costly and Wasteful
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Concrete Flumes are Perishable and Obstructive

All Three Waste Water—Time, Money, Land and Labor

In its day each of the above methods served a purpose, but each was too wasteful and expensive to prove permanent. This made necessary the development of the "K T"—a System whose success has been so universal as to practically revolutionize irrigation methods throughout the Southwest. The "K T" is Efficient, Economical, Permanent. Once installed, your Irrigation Troubles will be overcome forever.

Write for the 8th Edition of our Brown Book. It's of priceless value to every rancher—yet costs you nothing.

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1230 E. 28th STREET

LOS ANGELES, CAL.

Use KEROSENE Engine Free!

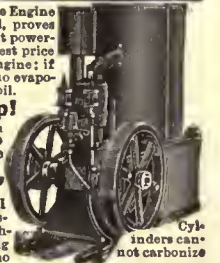
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Gasoline is 9c to 15c higher than coal oil. Still going up. Two pints of coal oil do work of three pints gasoline.

Amazing "DETROIT"

—only engine running on coal oil successfully, uses alcohol, gasoline and benzine, too. Starts without cranking. Only three moving parts—no cams—no sprockets—no gears—no valves—the utmost in simplicity, power and strength. Mounted on skids. All sizes, 2 to 20 h. p., in stock ready to ship. Engine tested before crating. Comes all ready to run. Pumps, saws, threshes, churns, separates milk, grinds feed, shells corn, runs home electric lighting plant. Prices (stripped), \$29.50 up. Sent any place on 15 days' Free Trial. Don't buy an engine till you investigate the money-saving, power-saving "DETROIT." Thousands in use. Costs only postal to find out. If you are first in your neighborhood to write, you get Special Extra-Low Introductory price. Write! (138) Detroit Engine Works, 301 Bellevue Ave., Detroit, Mich.

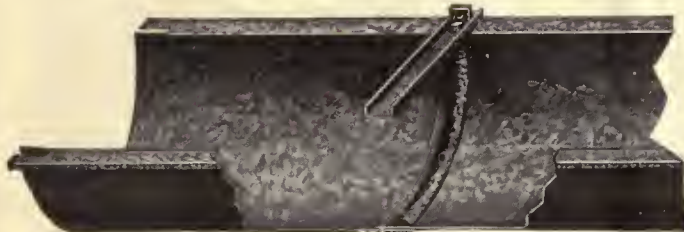


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(Newcomb Patent)

Made entirely of rust-proof, galvanized iron. No bolts or rivets used in construction. This flume is considered by experts to be the most serviceable equipment for the purpose on the market. A careful examination of the construction as shown herewith will convince those who are acquainted with irrigation conditions of its lasting quality and the ease with which it may be put together. Complete information, with prices, will be furnished on application to the

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Section of Flume

The Farm Burden Bearer

YOU and your farm wagon spend a great deal of time together. Of all farm tools it is your standby. Its wheels bear the burden of big loads—towering racks of hay and grain, sacks of produce, loads of sand and gravel, anything that needs moving, over miles of roads to market. It takes solid strength to stand up long under that. When next you ride on a load, listen to the constant racking, creaking, groaning sound of the wagon box, wheels and running gear as the load pitches back and forth over the road ruts. Not an unpleasant sound, but the

strain that causes it is hard on the wagon. I H C wagons—

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give the buyer the most he can get for his money because they defy hard usage for the longest time, and are easiest on the horses.

This makes I H C wagon reputation: Selection of the finest grades of lumber, oak, hickory and pine, and of the best quality steel and iron; many months of toughening air-drying for every piece of wood; skilled assembling of parts, fitting of bolts and rivets, and perfect shaping and ironing; application of the purest paint to act as wood preservative and to prevent shrinking and warping of the wood. When the wagon is ready for the farmer, it is practically perfect in every detail and thoroughly up to the I H C standard.

And there are many other reasons we have not room for here why I H C Wagons are the best to buy. Weber and Columbus wagons have wood gears; New Bettendorf and Steel King have steel gears. A visit and a talk at your local dealer's, where the wagons may be seen and studied, will soon convince you as to the wagon you want. Get catalogues from the dealer, or, write the nearest branch house.



WESTERN BRANCH HOUSES: Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.
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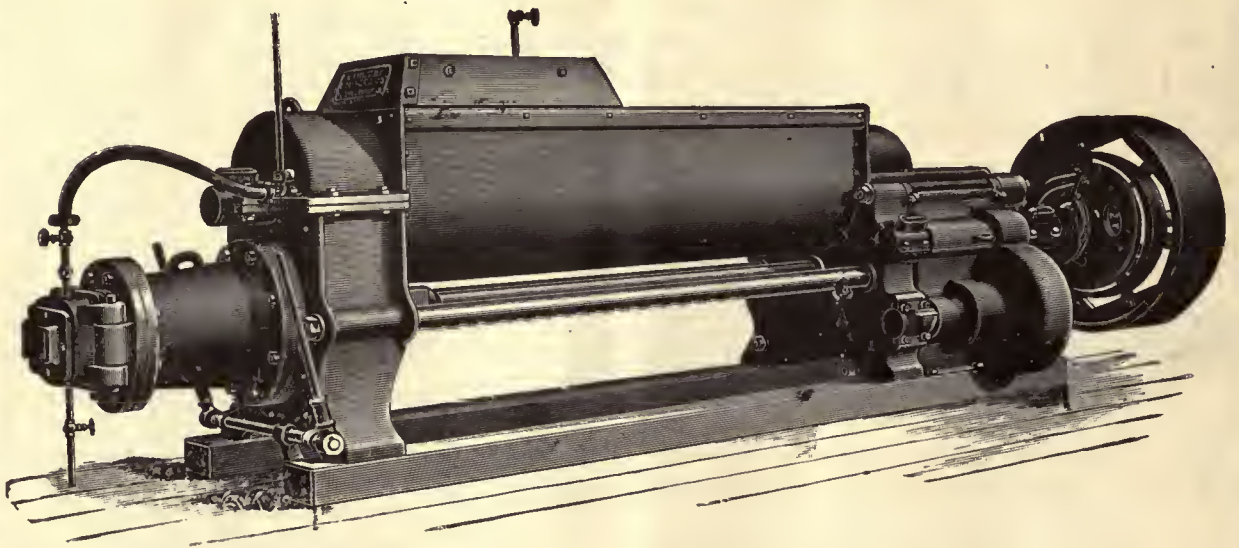
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Amazing "DETROIT" Kerosene Engine shipped on 15 days' FREE Trial, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing. No waste, no evaporation, no explosion from coal oil.

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Gasoline is 9c to 15c higher than coal oil. Still going up. Two pints of coal oil do work of three pints gasoline.

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Are you sending irrigation water through dirt ditches? If so, half of it is sweeping down through the sand, and *your money is going with it.*

We are the originators of the scientific irrigation system. Our Gates and Valves are the product of many years' investigation, study and improvement—the best in the world.

Install our economical irrigation system as others are doing—and do it before you lose in the race for dollars through wasteful methods and keen competition. The

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Little Dutchman



One Man

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Plows 14 Inches Deep—Saves Moisture

The Little Dutchman One-Man Tractor Gang saves time and power as well as moisture.

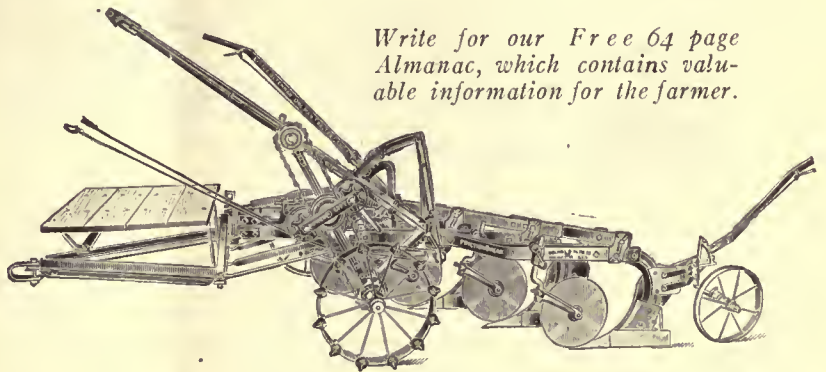
The Deep Furrow style plows 14 inches deep and forms deep moisture reservoirs.

Plows can be coupled in units of one, two or three gangs, forming plows of four, eight or twelve bottoms.

Built in two styles, Regular and Deep Furrow, with either the plain or friction brake beam. Both styles also built with our automatic power lift.

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Raises and Lowers the Bottoms by Simply Pulling a Rope



Write for our Free 64 page Almanac, which contains valuable information for the farmer.



MOLINE PLOW CO.

Dept. 3

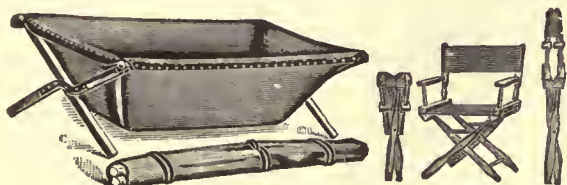
Moline, Ill.





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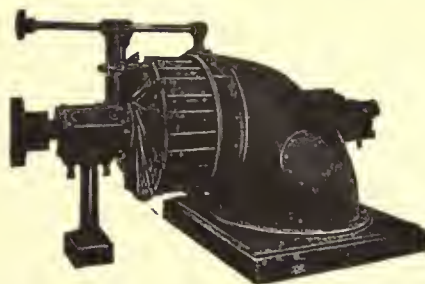
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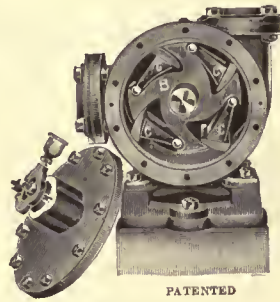
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One customer has 500 in use.

Capacity, 5 to 500 gallons per min.

Tell us about your pumping problems.

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Twenty-Eighth Year

THE IRRIGATION AGE

VOL. XXVIII

CHICAGO, OCTOBER, 1913.

No. 12

THE IRRIGATION AGE

With which is Merged

The National Land and Irrigation Journal

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD
THE IRRIGATOR

D. H. ANDERSON
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Old No. 112 Dearborn St.

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D. H. ANDERSON, Editor

ANNOUNCEMENT.

The "Primer of Hydraulics" is now ready; Price \$2.50.
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Official organ of the American Irrigation Federation.
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Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the
only publication in the world having an actual paid in advance
circulation among individual irrigators and large irrigation corpo-
rations. It is read regularly by all interested in this subject and has
readers in all parts of the world. *The Irrigation Age* is 28 years
old and is the pioneer publication of its class in the world.

Alsike Seed a Profitable Crop

Raising of alsike clover for the seed
is getting to be a very profitable in-
dustry in Idaho. Seed buyers un-
hesitatingly give preference to the
Idaho-grown product, pronouncing it
the best on the market. The thresh-
ing season is now at its height and a number of
large yields are reported.

E. L. Wonacott, living two miles west of Kim-
berly, Idaho, threshed fifteen acres of alsike on Au-
gust 20th. From this area he obtained 180 bushels
of seed, an average of twelve bushels to the acre.
At \$9 a bushel, the regular market price, this was
worth \$1,620, an average of \$108 an acre.

R. A. Kennedy, Twin Falls, is another man
who has found the growing of alsike seed a good
thing. He had twelve acres this year, from which
he secured 132 bushels, for which he obtained
\$1,188, or \$99 an acre.

L. A. Snyder, Twin Falls, has also done well
in this line. He had a number of acres this year
which averaged him something over \$84 an acre.

It certainly pays to raise seed at these prices,
to say nothing of the feeding value of the hay that
is left.

More About Sweet Clover

Many men have been employed re-
cently near Nampa, Idaho, in cutting
wild sweet clover along the ditches
and roadways. The work is being
done for a local milling company,
which will stack the clover and later
thrash it for seed, that will be used in the manufac-
ture of dye and also for planting in soils lacking in
humus.

The clover is cut with scythes and immediately
stacked to prevent the loss of seed by drying. An
ordinary clover huller is to be used to separate the
seed.

This journal published an article some months
ago concerning sweet clover and its proven value
in feeding sheep, but only recently have we heard
of its seed being used for commercial dye.

The value of sweet clover as a leguminous plant
has long been known, but it is only recently that
it has been harvested for profit in a commercial
way.

On sandy and depleted soils it is said to have a
valuable capacity for appropriating free nitrogen
from the air and storing it in the roots of the
plants. It is a valuable fertilizer, and it is pre-

dicted by the AGE that we have not yet learned its true value. The editor of this journal has always been of the opinion that the fibrous stalks would give us something of great commercial value when properly cured and treated.

Ties Down Sandy Soil

Ranchmen near Wendell, Idaho, who have streaks of sandy soil on their holdings, have had good success this year in getting good stands of rye. This crop planted in 1912 made a good start and this spring the sandy soil showed heavy foliage. When rye is once set in sandy soil it thrives so that when the grain is cut, leaving a long stubble, there is good protection against the winds. Some of the ranchers sow alfalfa in the rye stubble and thereby secure double protection, as when the alfalfa is well set the subject of sand drift is no longer a problem.

Telephone Aids Forest Service

The telephone is playing an important part in fighting forest fires. The Government is spending large sums in extending lines where they will prove of greatest value.

The appropriation this year for work of this character is to provide the present forces with additional wires and lines of telephone in all directions through the Government preserves.

The cost of providing these necessary safeguards will be saved many times over by the prevention of the spread of fires which may be easily stamped out in their inception.

Short Line to the Pacific Coast

Montana and Idaho people are greatly interested in the construction of a connecting line of railroad from Rogerson, Idaho, on the Oregon Short Line, to Wells, Nevada, on the Union Pacific. This is the most important piece of railway construction that has been undertaken in the West in many years. It will shorten the haul from Butte, Mont., to San Francisco by 700 miles, and afford an easy outlet for the products of all the vast country south of Butte and north of the Nevada boundary.

As at present situated the people of Montana and Idaho can only reach the Pacific coast by way of Portland, Ore., unless a long detour is made via Ogden, Utah, to reach the Union Pacific. This is direct enough so far as the people of the Twin Falls country are concerned, but there are others, lots of them, who must be considered.

The freight business over the new cut-off prom-

ises to be enormous. A saving of 700 miles in the haul will be a big inducement to shippers. It means a great impetus to the fruit-growing industry, especially apples, as the crop may be sent direct to San Francisco and from there distributed all over the world. China, Japan and the western coast of South America will be within handy reach, and the opening of the Panama canal will make the eastern countries of South America and the eastern part of this nation likewise accessible.

Surveyors are already at work mapping out the route from Rogerson to Wells, and it is the intention of the railway managers to expedite the construction.

Tri-County Fair at Jerome, Idaho

Gooding, Minidoka and Lincoln counties have formed a Tri-County Fair Association and will give the first annual fair and street carnival at Jerome, Idaho, October 1, 2 and 3.

The men in charge of the work are Thomas Jaycox, president; E. G. Gauss, vice-president; J. M. Hale, secretary, and P. R. Kartzke, treasurer. These men are all practical hustlers and under their management the fair promises to be a big thing for southern Idaho.

Liberal subscriptions have been made by the people of Jerome and other interested localities, and the work of compiling a satisfactory premium list has been started. It is promised that the prizes will be unusually numerous and attractive.

The street carnival, which is to be a feature of the fair, will be amusing and entertaining.

Opportunity For Grape Culture

That there are thousands of acres in Idaho, Oregon and Washington excellently adapted to grape culture, is the opinion of Mr. A. Angermayer, a European and American vineyard and wine expert.

He states that farm and horticultural journals generally print extended articles about the loss and enormous waste of all kinds of unripe, overripe, inferior and spoiled fruits, caused by wind storms, harvesting, packing and many other causes. Mr. Angermayer also says that conferences are held throughout the West and Northwest to discuss the problem of how to reduce this annual loss by utilizing unsalable fruit by canning or exportation, but so far no reasonable solution has been arrived at. In further conversation, the gentleman stated that few people of the Northwest are aware of the fact that in scientific table grape and wine grape culture there is no waste possible and he asks why people in several of the best adapted districts of the North-

west do not produce more grapes and utilize them properly.

Mr. Angermayer says also that from long study he has come to the conclusion that California, now producing the best qualities of foreign grapes, cannot raise such high grade qualities as may be produced in many localities in Washington, Oregon, Idaho and some sections of Montana.

The gentleman fails in one particular, viz., that of giving specific information as to the particular locations in each State; nor does he give other information as to the varieties to be planted, the cost of settings or the ultimate value of the crop on each acre. Should Mr. Angermayer furnish this information he would enable the ranchmen and fruit growers to make a comparison between their present products, their value, and the final profit comparison, which would be of great assistance to those inclined to follow his suggestions.

Our readers who are interested should correspond with Mr. Angermayer.

Large Shipments From Twin Falls

It is estimated that fully 15,000 carloads of farm and orchard products will be moved out of the Twin Falls country this fall. Apples and potatoes will constitute a large part of these shipments, while grain and livestock will also be prominent.

Digging of the potato crop has already been started and reports from various parts of the district show that it is very large and the tubers of excellent quality. Choice hand-sorted specimens are selling at wholesale at 70 cents a bushel, provided they are of the distinct Twin Falls size, this kind being in active demand for dining car and hotel use. When a man can raise 400 bushels of 70-cent potatoes to the acre—which is not uncommon—it is one of the best-paying crops the farmer can grow.

New Bridge Across the Snake River at Hansen

Agitation for the construction of a new bridge over the Snake river at Hansen, Idaho, to connect the First Segregation with Twin Falls, has been started by T. G. Wilson, of Eden. If this amounts to anything it means the bringing of the settlers on 30,000 acres directly into connection with Twin Falls and its railway outlet to market.

At present the only way of reaching Twin Falls from the First Segregation is by driving through miles of sand to Shoshone Falls and then ferrying across the river. A bridge near Hansen would cut the haul down to ten miles, give decent roads, and be to the benefit of both the people of Twin Falls and those who live on the Segregation.

North Platte Settlers Complain

A loud and vigorous howl is heard from the Platte River Valley lying below what is known as the Pathfinder Dam. In former years the ranchmen along this valley were enabled to divert sufficient water for ordinary agricultural conditions and were frequently supplied through storm waters and storage with all of the moisture the land needed for a normal crop. Since the Government has built the great Pathfinder Dam the people living along the lower reaches of that stream for a distance of one or two hundred miles are unable to secure any water without pumping from the subterranean flow. One thousand farmers in the territory mentioned have taken the matter into court and will file claims against the Federal Government on account of these conditions. They claim that the Government has taken so much of the water out of the upper reaches of the North Platte that none is left for their use, and they get no assurance from Reclamation Officials that water may be secured in future years; these ranchmen therefore face this situation, they have purchased land from Government when water was assured, the Government has in turn gone farther up the stream and put in a dam which is taking all of the water formerly secured by them and is giving it to others who are settling on tracts far above. The question of prior rights does not seem to prevail in this instance and it is apparently another illustration of the carelessness of the Reclamation Officials for the welfare of the old-time settler. Hundreds of thousands of acres of land are involved in this suit, as the rainfall is not sufficient to mature crops in any season, and these farmers will file a claim against the Government for the value of the crops for not only last year, but each succeeding year. It is their intention also to appeal direct to Congress and to call attention to the fact that all this land was subject to cultivation before the Pathfinder Dam was erected. The peculiar situation is that in sinking the foundation of the Pathfinder Dam the volume of the underflow is apparently diminished.

Congress will be asked that the Government either release this subterranean stream or reimburse the farmers who have been dependent wholly upon that method of irrigation. Certain Western journals state that the old question of riparian rights is involved in the matter and that this is a serious subject to bring up in connection with a suit of this character.

The fact remains, however, that the Government has deprived thrifty ranchmen along the lower reaches of the North Platte River of water that it would appear rightfully belongs to them. Just why

the Reclamation Officials should build a dam to supply lands farther up stream for new settlers and take away the water from farmers who are already established is one of the questions which will no doubt be brought out and discussed thoroughly in any claim that may be brought before the Federal Government.

Perhaps the matter may be adjusted without suit if it is brought to the attention of the proper authorities. It is barely possible that Secretary Lane can correct the conditions after having studied it carefully, but this subject should have been understood clearly by the Reclamation Officials prior to the time that the Pathfinder Dam was built. They should have understood from former experience that this would be the natural result of the construction of this dam and some arrangement should have been made for the protection of the farmers who had received water continuously in previous years and who are now without it. What explanation Director Newell may make concerning this situation is a question; we will be very glad indeed to hear his side of it and publish whatever statement may come down from him or his publicity director, C. J. Blanchard.

**Peculiar
Conditions
in
Wyoming**

In an article entitled "Hope Long Deferred" in this issue, the writer presents some interesting facts concerning the relations of the Wyoming Central Irrigation Company and officials of the State of Wyoming, but evidently for the sake of brevity, fails to discuss matters of importance to every citizen of that State.

It is evident that the statement that "certain large interests in Wyoming have apparently opposed development as inimical to those interests" is too modest an expression—in other words, is indefinite and therefore in a sense unjust; it may be well to call for a showing of hands by a reversion to the cattle, sheep and wool interests in Wyoming. This industry is extensive and is dominated by a comparatively small number of citizens possessing capital and apparently unlimited political influence.

Some of these men apparently use their power and influence openly or quietly and by lukewarmness (possibly a stronger word would express it better) to retard the development of the best portions of the State.

They take the attitude that free range and pasture should be preferred to productive farms, although any competent judge knows that a given area efficiently cultivated will support several times the number of people, yield many times the number

of sheep, cattle or sacks of wool, and pay many times the taxes that the free range system is turning into the State. Not all of those identified with these interests are so blind as to wish to delay the growth and prosperity of the State, but a cursory view of the situation shows that a number of the leading citizens, who are strong financially and politically, take that attitude.

In discussing this article, it may be well to call attention to the fact that when the Wyoming Central Irrigation Company was released from its contract with the State, had assigned to the State Land Board its water rights, rights of way and reservoir easements, the State, presumably for the sake of a hoped for quicker development of this project, and the consequent advancement of the State as a whole, ignored the personal contracts for water made at the solicitation and upon representations of recognized agents of the State, between many settlers and the Wyoming Central Irrigation Company.

The State Land Board has now contracted with a new company to carry through the original project, but has evidently ignored a clause in the Constitution that provides that private property shall not be taken for public use without due compensation, in other words, it has virtually set those contracts aside and allows the new contractor to charge and collect from the homesteaders prices for water from five to twenty dollars an acre more than the homesteaders hold contracts for; this after collecting, by State and County taxes on real estate and improvements for years at an excessive valuation on unproductive property and a constant drag upon the owners, would appear unjust to say the least.

It should be understood that the new owners or contractors are not responsible for this condition and all property holders should hasten and encourage the development of the project.

By proper development this taxable property should show a valuation of many millions within ten years and at the same time open up a great field for the sale of agricultural implements of all kinds.

One feature of the new deal is of advantage to the settlers, viz., that the new contractors will construct ditches to each legal sub-division instead of the old plan of delivering water to within three miles of each claim. This relieves the land owner from the expense of digging a ditch from one to three miles long, to bring water to his land. This provision is required by the Carey Act and practice is thus made uniform. We will discuss the attitude of the cattle and sheep in a future issue.

OPEN LETTER

To His Excellency, Governor Haines, and to the State Land Board of Idaho:

It is now (September, 1913) four years since the widely heralded "opening" of the notorious "Big Lost river" Carey Act tract. The writer was present at that opening and made his filing as Entryman number thirteen. He also appeared as attorney for Entryman number one—Mr. P. D. Myer of Cleveland, Ohio. It is three years or more since the date set for the promised delivery of water.

Both of us paid for the privilege of filing \$4.00 per acre, to the Irrigation company, upon the so-called "Water Right," and 25 cents per acre to the state—to its "Carey Act Trust Fund." Neither entry was made for speculative purposes, as correspondence in the writer's hands will abundantly demonstrate—this correspondence including a bona fide offer made in 1910 for assignment of the writer's entry at a figure which would have left a comfortable margin of "profit."

After all these years of unfulfilled promises and with a vista of apparently endless litigation between conflicting interests, it seems appropriate that a few remarks should be addressed to you, and, through yourselves, to the citizens of the great state which has entrusted the administration of its two greatest resources—land and water—to your hands. These remarks will be addressed to you in no spirit of hostility and in the light of some information with regard to these primal resources of the so-called "arid land" states.

When I arrived in Idaho, in 1909, after attending the Irrigation congress at Spokane, it was as a homeseeker and with entire faith in the integrity of your state, which was then making extraordinary efforts to attract settlers within its borders. In the fall of 1909 a number of Carey act "openings" were scheduled to take place. I investigated the merits of all of them as far as was possible, from the documents upon file with the State Land Board. Your state engineer's report upon the "Big Lost River" tract was satisfactory—your Irrigation Code and Carey Act Statutes appeared to contain sufficient guarantee of faithful performance of contract. The report of the "board" was favorable—the construction bond, while grossly insufficient, was entirely "regular" and executed with a strong company. The state's original contract, of 1909, was entered into with Mr. George A. Speer of the Trowbridge & Niver Co., of Chicago. Copies of telegrams from Chicago banks, doing business with Mr. Speer's company, and vouching for his financial integrity, were shown me. Whether the financial status of the Big Lost River Irrigation company, to which Mr. Speer subsequently assigned this contract, was ever looked into I cannot say.

As a last recourse, and because your Carey Act Statutes made the escrowing of settlers' first payments, by the Land Board, optional instead of man-

datory, I put the question point blank to the gentleman who, at that time, occupied the honorable position of State Land Register, and was told, without qualification or reservation, that the Entrymen's first payments upon the Big Lost River tract would be held in escrow by the Land Board. Was this a case of deliberate falsification by a trusted official of the state, or was it not? I leave it to your judgment to decide. Incidentally, was it criminal disregard of the obligation of the state to safeguard its future citizens, when, unlike all other "Carey Act" states, it made the escrowing of Carey Act settlers' first payments subject to the whims of the board instead of a statutory performance? Again, as to the bare facts of construction—it is, and always has been, difficult, out of the mass of conflicting testimony, to get at the real facts of the Lost River dam, but the conviction must be forced upon the observer that the statutory provisions for state's supervision of reservoir construction were not carried out, otherwise it is inconceivable how the apparently faulty construction could have proceeded so far without interruption.

With this digression let us proceed with reminiscence. After these investigations at Boise, the writer journeyed to Arco, the place of the "drawing," with some hundreds of others, misled by the active interest displayed by state officials and by the cunningly worded "prospectuses" of the company, implying that the state and federal governments vouched for the soundness of the project and in some way guaranteed its successful execution. All this, be it remembered, before the General Land Office had inaugurated its present regime of rigid investigation of such projects. The incidents of the "openings" must still stand out clearly, in the minds of the many who attended, how the project was lauded, in public addresses, by officials of the land board and by other "public-spirited citizens" in private and official life, as well as by the "experts" commissioned by the company to attend; how everything possible was done to stimulate the buying propensities of the crowd, and how successful these efforts, as demonstrated by the record-breaking sales made. Then the return home—a long distance for many—and the wait for the "Irrigation Season" of 1912, which, instead of the promised water, brought forth nothing but dilatory tactics and evasive letters upon the part of the company. Followed the agitation, by the townspeople of Mackay, against the faulty construction of the dam, its inspection and condemnation with cessation of work, default of interest payment upon the flood of bonds against the project put out by the Trowbridge & Niver concern (whose members were heavily interested in the irrigation company itself), receivership of the company, failure of the bonding house, unsuccessful efforts to revive the project and the suit of the contractor to foreclose upon his lien, decided in his favor. As to the marketing of the bonds, the prices secured, the representations made to purchasers, the uses to which the proceeds were put, all kinds of stories are in circulation and in print, but to these matters, of which I have no personal knowledge, I will not revert, except to state that they were fully investigated and exposed in the "Financial World" of New York City (1911). An

appeal has been taken by the bondholders from the decision of the lower court in the matter of the contractor's suit before mentioned, but has not been heard, but even with the decision of the Appellate court, nothing will have been determined, unless the Chicago banking bondholders see fit to change their attitude, as indicated recently by a leading member of their committee, when he stated that "they would carry the case to the United States Supreme Court, if necessary." Through it all certain cardinal facts stand out clearly—there are settlers upon the ground who must take their chances upon the erratic flow of the river, with due regard to earlier priorities and with no stored water for late irrigation—some seven or eight hundred entrymen, all told, have paid to the defunct company several hundred thousand dollars which should have been held in escrow by the state, in the meanwhile losing interest upon their investment, not to speak of the loss of opportunity to found a home, for many of them the only opportunity that will ever have been presented. These payments, in all probability a total loss, so far as the company making restitution to the entrymen is concerned, the money spent upon the dam system apparently irretrievably lost, so much of the distributing system as was completed doubtless suffering much damage from non-use and lack of maintenance, the equities in the properties the bone of contention, and of seemingly endless litigation, the name of the state besmirched. With it all one hears no word about the interests of the non-resident entrymen. And what has the state done through all these perplexities? Has it followed the statutes governing cases where work is not complete within the contract period? Has it made any effort to collect upon the meager bond of \$175,000.00? Not unless it has done so within the very recent past. It has built a temporary spillway to save the valley below it and, through the receiver, has delivered some flood water to settlers upon the ground. In the last legislature a bill was introduced to refund to entrymen the first payments to the state (25 cents per acre), but it was—very sensibly—withdrawn and I, personally, opposed its passage to the full extent of my ability. No efforts toward resumption of construction or of completion of the works and the people who were mulcted out of a quarter of a million dollars for "first payments," not to speak of traveling expenses, locator's fees, and their time, may wait and abide their fate. Is it any wonder that "Idaho gets one permanent settler where she should have a hundred," as quoted from a recent public utterance of Governor Haines?

It seems that there must be a very real reason for the tremendous excess of unirrigated land under ditches, as shown by the latest census reports, notwithstanding the many thousands spent, in the past, upon "bureaus of immigration." As an example of what might have been done, witness the Wyoming Act (S. L., 1911), which provided that "no water right contracts may be sold until water is ready for delivery," also the "regulations" of other states providing that the "literature" of Carey Act companies must be submitted to the board for approval before going into the hands of the public, upon the theory

that it were better to call a halt upon so-called "development" if it cannot proceed without scandal.

It is dangerous to indulge in generalizations, but it is entirely safe to say that the vast majority of entrymen, not only upon the "Big Lost" project, but upon others, and in all the "Carey Act" states, have been led to enter land, in the past, almost entirely upon the strength of the carefully nurtured belief that the state or federal governments, or both, were "back of" these enterprises, in a real sense. Examples beyond the Big Lost River project are not necessary to point the moral of this tale, neither are they wanting, but it appears self-evident that the states, in their trusteeship of these great estates, are certainly under the most elemental obligation to protect both entrymen and bond buyers if need be from the effects of the chicanery and misrepresentation that has prevailed in the past. In the case of the "Big Lost River" project, your state is under a direct moral responsibility to see that the entrymen secure, at the earliest possible date, and regardless of any saving clause in the statutes, what they were promised for 1912—the completion of the system and delivery of water for equitable interests, in both of which they have already paid \$4.25 per acre. There is positively no line of argument or of reasoning by which this statement can be refuted. Every entryman under this project looks to the state to "make good" for its previous attitude of indifference which made the crash possible and, in his heart, feels that the state, if it does not soon demonstrate its good faith, will stand charged with turpitude. Immediate action should be brought to collect upon the contractors' bond of \$175,000.00 and, if necessary, a special session of the legislature called to provide funds for the speedy completion of the system by the state, thus following the precedent recently established by the legislature of Oregon in appropriating the sum of \$450,000.00 towards the completion of the bankrupt and unfinished "Columbia Southern" Carey Act project.

Respectfully submitted,

EDWARD BOHM.

Author "The Carey Act Manual," "Irrigation Finance," member Executive Committee National Irrigation Congress.

THOSE WHO WISH TO FOLLOW OUR SERIES OF ARTICLES ON ABUSES COMMITTED UNDER FEDERAL, CAREY ACT AND PRIVATE IRRIGATION PROJECTS SHOULD SUBSCRIBE FOR THE IRRIGATION AGE. SUBSCRIPTION PRICE, \$1.00 PER YEAR.

HOPE LONG DEFERRED.

Story of the Wyoming Central Irrigation Company.
Francis C. Tucker.

The Shoshone, or Wind River, Indian Reservation in Wyoming was opened to filing in August, 1906. It had been examined and reported on favorably by experts in irrigation, but the United States Reclamation Service had decided that it had already started irrigation schemes covering so much of Wyoming, as well as other States, that it could not undertake any more projects in Wyoming. Competent reports of area, character of soil, available water, cost of irrigation construction, etc., had been so favorable that the State of Wyoming authorized the State officials to secure construction by a contract. The United States Government simply allowed filing on homesteads under the ordinary provisions on ceded Indian Reservations; the State of Wyoming assumed no liability, is barred by its Constitution from assuming any, through act of its officials, except as they may be specifically authorized to make contracts. The State officials, however, caused the fact to be broadly advertised, that a contract had been made between the State and the Wyoming Central Irrigation Company to begin construction within 90 days and to carry on the work at a reasonably uniform rate that would complete construction within five years. The State assumed no financial liability, and under its Constitution could not assume any, but granted certain rights, and the privilege of furnishing water at stipulated prices, to the company, the company collecting from the homesteaders.

Certain large interests in Wyoming have apparently opposed development as inimical to those interests. Apprehension of this opposition, a conviction that the State officials were not sincere in their co-operation, the utter irresponsibility of the State under the constitutional provisions, the fact that the contract for construction was secured by a bond for \$25,000.00 (a ridiculous bond, for the construction of some millions of dollars worth of work), amounting to a mere option; and some minor symptoms operated to discourage settlement, and the influx of homesteaders was much less than had been hoped for.

To get prompt development and returns from a portion that would be easily and cheaply watered, the Wyoming Central Irrigation Company constructed a small canal to water a few thousand acres near the W. & N. W. railway and Riverton. This canal takes its water temporarily directly from the Wind River, but was intended to later (when the system neared completion) make this canal part of a main lateral from the large canal. The head-gate, deflection, etc., were of a comparatively temporary character on this account. Some settlers saw in this, or thought they saw, an attempt to make them pay an undue price for water, since the Wyoming Central Irrigation Company was empowered to charge the same prices under the same other conditions over the whole of the land to be irrigated, regardless of mere distance from the point of diversion from the river. These disaffected settlers and others formed an independent company and attempted by legal action to get independent water

rights to make them an independent competitor on part of the same ground. Long drawn out litigation and bitterness resulted, but the Wyoming Central Irrigation Company finally won and its franchises were confirmed.

Meanwhile the Wyoming Central Irrigation Company, instead of putting money into active construction, had endeavored to raise money for that purpose on bonds, and had found out that to raise money thus it would need to have a large number of contracts of settlers, secured by mortgage of their claims. But few settlers had at that time commuted and therefore few could give adequate security. After several months' trial it was found necessary to help some settlers to borrow money to commute so that



Bridge Station on North Fork of Wailua River, Kanai, Hawaiian Islands.

the amount of land necessary to meet the demand for security could be mortgaged. By the time this security was tendered the Wyoming Central Irrigation Company had become so discouraged by all its trials and tribulations that it refused to do as it had agreed to. It would take a large book to state the whole matter from either point of view.

In the early stages a Homesteaders' Association had been formed. The Executive Committee of that association worked hard to adjust this controversy through the State officials. It was felt that the terms of the contract between the State and the Wyoming Central Irrigation Company, though higher than in many smaller enterprises, were as low as would ever be secured on so large a project, and time was slipping away. In these serious delays several smaller projects, parts of the main

scheme, were brought forward, examined, found feasible and suggested to the State, but the State officials steadily refused to consider the granting of any water rights that conflicted with those granted previously to the Wyoming Central Irrigation Company, until those already granted had been returned to the State.

With the State officials so determined, it was necessary to persuade the Wyoming Central Irrigation Company to transfer the water rights that had been granted it as trustee, to some other party who would undertake the construction. Many months went by with this hope, which ended in disappointment. The State officials finally effected a settlement, releasing the Wyoming Central Irrigation Company from its contract, but permitting that

tion Company. This question is now before the Wyoming courts.

Finally it is alleged by the Wyoming papers of August, 1913, (seven years after the opening to settlement) that the Wyoming Central Irrigation Company has released all claims under its contract with the State except as to the district served by the "Riverton Ditch," and that the State of Wyoming by its land board has contracted with the Big Wind River Land & Water Company for the construction of an irrigation system that will reclaim approximately 210,000 acres. This time a bond of \$150,000.00 is demanded, and was not filed at last accounts.

The original settlers, or their survivors, will rejoice when sure of the prompt fulfillment of their hopes, but many will feel that they have been "holding the sack" in a long snipe hunt, having to pay for water five to twenty dollars more per acre than they had contracted for, to lose most of their time for seven years and the cost with interest of replacing improvements made on each claim in good faith, costing in cash, six years ago, from five hundred to two thousand dollars on each homestead. These losses are offset to only a very limited degree by slight concessions.

COOPERATIVE FOREST FIRE PROTECTION

During the last quarter of the fiscal year, the federal government entered into cooperative fire protection agreements with the following states: Maine, New York, Minnesota, Montana, Washington and Oregon. These six agreements contemplate the protection from fire of approximately 87,000,000 acres of land on the forested watersheds of navigable streams, for which purpose \$31,500 of federal funds have been made available. There are at the present time 14 states which are engaged in active cooperation of this kind, and it is possible that three new states, Kentucky, South Dakota and West Virginia will be added by early fall.

The federal government, though it has allotted a total of \$85,000 for the work of the present season, is a minor contributor in the aggregate. Under the impetus given to fire protection of navigable watersheds through this arrangement the cooperating states will expend an aggregate of \$3 for every dollar the federal government spends, to which may be added about \$2 more from private sources.

These amounts, of course, do not represent the sum total of expenditures for fire protection even in these states. For in some of them the state itself is spending considerably more money in the protection of forested lands lying outside the watersheds of navigable streams. On the national forests, too, the government is sending several times the amount of its contribution to cooperative fire protection in the states which contain federal timberland.

Aside from these governmental agencies the railroads, lumber companies (both individually and through their cooperative protective associations) municipalities and private land owners throughout the country are growing more and more alive to the needs of better forest fire protection and are devoting each year an increased sum to this work.



Kahoalele Falls, Kauai, Hawaiian Islands.

company to carry out and collect for its contracts for water furnished through the "Riverton Ditch" in consideration of the surrender to the State of all unused water rights granted it as trustee. By this settlement an apparent injustice has been done many settlers below the "Riverton Ditch"; they made contracts with the company at the prices stipulated by the State, and which presumably would have been just if the entire original system had been constructed, but which are in equity unreasonable, since the company constructed only the easiest part of the work, but charged the full acre price, as if the whole contract with the State had been performed. It is doubtful if there can be any relief demanded, in the face of the individual contracts between settlers and the Wyoming Central Irriga-

COST OF WATER PER ACRE.

C. J. Blanchard, Statistician U. S. R. S.

1. The cost per acre of water rights or of water for irrigation in the arid region, under the present conditions of construction, is far higher than is usually appreciated. During earlier decades, before any considerable number of large irrigation canals had been built, it was a relatively simple and inexpensive matter for farmers to join together and build small canals that could be enlarged as the demand for water increased. All such easily available opportunities, however, have been utilized and development has proceeded to a point where on most of the recent irrigation systems it has been



M. R. D. Owings, Recently Elected Vice-President The Rumely Co., La Porte, Ind.

necessary to provide storage, thus adding materially to the cost.

2. There has also been a notable increase in the cost of labor and of materials used in construction. This condition has been pointed out in various hearings before Congress, notably in the series before the Ways and Means Committee of the House of Representatives at the time of the granting of the \$20,000,000 loans. It is there shown, notably in a statement submitted by Representative Mondell that one of the arguments for increase of the reclamation fund was in the fact that common labor had advanced from the time of the preparation of the plans for works in 1903 and 1904 from 20 per

cent to 50 per cent, and that the efficiency of such labor had fallen off in greater proportion. Costs were also affected by the increased price of materials and equipment.

3. The following table gives in condensed form lists of some of the recently constructed and proposed larger private projects and Carey Act projects. These figures, obtained from printed reports of state engineers and public data show that on over 90 modern irrigation systems being built by private or corporate capital the cost per acre averages nearly \$53. This cost does not include the annual cost for operation and maintenance.

4. The cost to the settler is increased by the fact that payment is made on most of these projects in installments bearing interest at 6 per cent or even more. The total payments made for such a water right with simple interest at 6 per cent would be about \$70.50 per acre on the basis of ten equal annual instalments of the principal as compared to \$53 without interest:

COST OF PRIVATE IRRIGATION PROJECTS.

Name of project or company.	Acreage in project	Cost of water right charge per acre (a)
<i>Colorado:</i>		
Amity Canal	80,000	\$100 (b)
Beaver Land and Irrigation Co.	20,000	175 (b)
Catlin Canal	25,000	100
Colorado Cooperative Co.	5,200	60
Denver Reservoir and Irrigation Co.	200,000	45
East Palisade Irrigation District	645	63
Fort Lyon Canal	70,000	100 (c)
Grand Valley Canal	40,000	60 (d)
Greely Poudre Irrigation Co.	125,000	45
Mesa County Irrigation District	2,568	73
Orchard Mesa Irrigation District	9,122	119
Otero Irrigation District	20,000	40
Palisade Irrigation District	6,000	41
Paradox Valley Irrigation Co.	30,000	45
Pueblo-Rocky Ford Irrigation Co.	100,000	150 (e)
Redlands Irrigation & Power Co.	5,000	100 (f)
Routt County Development Co.	39,000	45
South Palisade Heights Irrigation District	700	127
<i>Montano:</i>		
Conrad Land and Water Co.		40
Great Falls Land and Irrigation Co.	36,000	50
<i>Nebraska:</i>		
Belmont Canal and Irrigation District	20,000	25 (g)
Tristate Canal	60,000	42
<i>New Mexico:</i>		
French Land and Irrigation Co.	40,000	50
<i>Oregon:</i>		
Bonanza Project	20,000	39
Eagle Valley	21,700	80
Turnish	6,000	60 (h)
Paradise	100,000	60
Willamette Valley	20,000	50
<i>South Dakota:</i>		
Red Water Irrigation Ass'n.	4,000	40
<i>Utah:</i>		
Provo Reservoir	12,000	80
Utah Lake Pumping	8,000	40 (i)
<i>Washington:</i>		
Cascade Canal Co.	10,000	50
Congdon Canal Co.	4,200	121
Kenewick Canal	14,000	163
Lower Lakima Irrigation Co.	12,500	129
Selah Moxie	7,000	86
Selah Valley Development Co.	10,000	150
Union Gap Irrigation Co.	5,000	135
Washington Irrigation Co.	50,000	46

(a) Engineers' estimates where project is proposed or incomplete.

- (b) Estimated at from \$75 to \$150 per acre. Includes land.
 (c) Estimated at from \$75 to \$150 per acre.
 (d) Per miner's inch.
 (e) Includes land.
 (f) Estimated at from \$65 to \$150 per acre.
 (g) For river rights only. Purchase of Pathfinder Reservoir water will increase this to \$35.
 (h) Estimated at from \$50 to \$70 per acre.
 (i) Estimated at from \$40 to \$50 per acre.

COST OF CAREY ACT PROJECTS

Name of project or company.	Acreage in project	Cost of water right charge per acre (a)
<i>Colorado:</i>		
Great Northern Irrigation & Power Co.	2,121	\$ 55
Colorado Realty and Security Co.	45,875	45
Toltec Canal Co.	14,853	40
Colorado Land and Water Supply Co.	16,278	45
Two-Butte Irrigation and Reservoir Co.	22,000	35
Valley Investment Co.	24,000	60
<i>Idaho:</i>		
American Falls Canal & Power Co.	57,242	40
Big Lost River Irrigation Co.	78,242	40
Birch Creek Irrigation Co.	20,000	50
Blackfoot North Side Irrigation Co.	22,280	
Black Canyon Irrigation District	98,492	72
Blaine County Irrigation Co.	14,720	40
Boise City Carey Act Project.	151,000	
Bruneau Irrigation Co.	40,000	60
Emmett Irrigation District.	5,800	50
Grandview Extension Irrigation Co.	1,000	65
Grassmere Irrigation Co.	47,500	65
Hansen, C. V., Mackay Project	3,456	40
Hegsted, Victor, Project.	3,410	40
High Line Pumping Co., Ltd.	3,860	45
Houston Ditch Co., Ltd.	1,884	35
Idagon Irrigation Co., Ltd.	9,000	60
Idaho Irrigation Co., Ltd.	130,000	50
Keating Carey Land Co.	15,597	30
Kings Hill Extension Irrigation Co.	9,655	65
Kings Hill Irrigation and Power Co.	13,359	65
Lemhi Irrigation Co.	3,500	50
Little Lost River Land & Irrigation Co.	20,000	30
Marysville Canal & Improvement Co., Ltd.	6,134	20
Owsley Carey Land and Irrigation Co.	8,600	35
Owyhee Land & Irrigation Co.	29,535	55
Owyhee Irrigation Co., Ltd.	3,296	45
Pahsimera Project.	6,000	30
Portneuf-Marsh Valley Irrigation Co.	11,914	35
Pratt Irrigation Co., Ltd.	4,674	40
Snake River Irrigation Co., Ltd.	6,500	50
Thousands Springs Land and Irrigation Co.	6,300	30
Twin Falls Land and Water Co.	244,000	25
Twin Falls North Side Land and Water Co.	207,144	45
Twin Falls Oakley Land and Water Co.	45,000	65
Twin Falls Raft River Irrigation Co.	99,668	50
Twin Falls, Salmon River Land & Water Co.	127,707	40
West End Twin Falls Irrigation Co.	46,000	50
<i>Montana:</i>		
Billings Land and Irrigation Co.	27,000	40 (j)
Big Timber Project.	17,194	60
Valier Project.	115,100	40
<i>Oregon:</i>		
Central Oregon Irrigation Co.	139,204	40

Central Oregon Irrigation Co.	74,198	60
Columbia Southern Co.	27,000	50 (k)
Deschutes Land Co.	31,082	36
Deschutes Reclamation & Irrigation Co.	1,280	40
Desert Land Board.	27,000	
Portland Irrigation Co.	12,000	46
Powder Land & Irrigation Co.	65,000	100 (l)
<i>Utah:</i>		
Mosida Pumping Plant.	8,000	150 (m)
<i>Wyoming:</i>		
Big Horn County Irrigation Co.	20,411	50
Boulder Canal.	6,120	30
Burch Canal.	35,887	50
Carbon County Land & Irrigation Co.	7,793	30
Cody and Salisbury Canal.	77,199	
Cody Canal.	26,429	50
East Fork Irrigation Co.	4,901	30
Eden Land & Irrigation Co.	95,658	30
Elk Canal.	2,724	30
Fisher Ditch.	320	10
Green River Land & Irrigation Co.	75,257	35
Hammit Canal.	6,295	60
Hanover Canal.	10,682	50
Hawk Springs Project.	12,238	50
Hubbard Canal.	38,604	40
James Lake Irrigation Co.	14,554	35
La Prele Ditch & Reservoir Co.	18,558	50
Lovell Irrigation Co.	11,320	25
McDonald Canal.	15,159	50
Medicine Wheel Canal Co.	22,385	30
North Laramie Canal Co.	4,133	50
North Platte Canal & Colonization Co.	14,424	30
Big Horn Basin Development Co.	204,650	50
Paint Rock Canal.	53,162	50
Platte Valley Canal.	18,171	30
Rock Creek Irrigation Co.	11,696	45
Sahara Ditch Co.	7,920	50
Sidon Canal and extensions.	20,559	30
Tinsleep-Bonanza Canal.	16,486	40
Uinta County Irrigation Co.	26,000	35
Wheatland Industrial Co.	33,115	45
Wyoming Land & Irrigation Co.	4,526	50

(a) Engineers' estimates where project is proposed or incomplete.

(j) Estimated at from \$20 to \$ 60 per acre.

(k) Estimated at from \$50 to \$ 60 per acre.

(l) Estimated at from \$75 to \$200 per acre.

(m) Estimated at from \$100 to \$250 per acre, including land.

5. For comparison with the costs of the foregoing private and Carey Act projects there is given in the following table a partial list of the projects being built under the terms of the Reclamation Act showing the total acreage in them and the charges for water rights for completed portions of such projects as far as these have been fixed by public announcement of the Secretary of the Interior. These figures are seen to average a little over \$41 per acre:

		Cost	
State	Project	Approx. acreage	per acre
Arizona-Cal.	Yuma	131,000	\$55 \$66
Idaho	Minidoka	118,700	22 30
Montana	Sun River	216,346	30 36
Montana-No. Dak.	Lower Yellowstone	60,116	45
Nebraska	North Platte	129,270	45 55
Nevada	Truckee-Carson	206,000	22 30
New Mexico	Carlsbad	20,277	32 45
Oregon	Umatilla	25,000	60 70
Oregon	Klamath	72,000	30
South Dakota	Belle Fourche	100,000	30 35
Washington	Okanogan	9,900	65
Washington	Sunnyside	102,824	52
Washington	Tieton	34,613	93
Wyoming	Shoshone	164,122	45 50

(Continued on page 387)

WARNING AGAINST DANGEROUS POTATO TUBER MOTH.

U. S. Department of Agriculture Issues Important Instructions Designed to Save Potato Crop in Many Sections of the United States—
Many Potato Growers Abandoning Raising of Potatoes.

The potato Tuber Moth is working such injury to potato crops in various parts of the country, especially in California and Texas, that the Bureau of Entomology of the U. S. Department of Agriculture has issued a special warning and instructions to potato growers to help them overcome this highly injurious pest. According to the specialists this moth is being rapidly spread over the country in shipments of infested potatoes and by careless methods of using and distributing seed potatoes. The warning is issued at this time in order to enable farmers to take special action with the seed they will use for the fall crop.

The Department particularly urges potato growers to sort the potatoes for seed two weeks after digging and then to sort them over two weeks later. The tubers unaffected by the tuber moth should then be placed in a moth-proof bin. It is easy to pick out the infested tubers because of the excrement of the moth, which adheres by means of a web to the outside of the potatoes and can be easily detected.

The tubers placed in the moth-proof bin, after final sorting, should then be fumigated by means of carbon bisulphid (or bisulphid of carbon as it is also known), in order to kill any moths which might have bred out or have slipped in through crevices, and when the bin was opened. Carbon bisulphid is applied by pouring small quantities into flat vessels such as milk pans or pie tins. An average of 3 pounds should be used in 1,000 cubic feet of space. It is more effective at high temperatures, 80° to 90° Fahr., being best. About a pint is poured into each receptacle and the pans are placed in the bins at the top. The gas being heavier than air naturally penetrates the mass of potatoes, reaching those at the bottom. The bin should be tightly closed for from 24 to 36 hours with good assurance that the germinating power of the seed is not destroyed. The utmost care should be taken that no fire, such as that from a cigar, electric fan, stove, or even a gas light or lamp should be brought into the vicinity. Otherwise, as the gas is very inflammable a fire may result or a serious explosion may follow.

All potato growers should keep a careful "look-out" after fumigation. At first the fumigated seed potatoes should be inspected daily to detect any growth of the insect; later, observation every other day and finally once a week should be sufficient. If there is any indication that the tuber moth is propagating, a second fumigation with carbon bisulphid should be given.

This method of saving seed potatoes is so simple, although very effective, that the specialists fear that many potato growers will disregard it.

In order to grow fall potatoes, the government points out that it is necessary for farmers to work overtime on a cleaning up campaign, which should begin at once on receipt of this special notice. Small and useless tubers and tops should be promptly cleaned up and burned. The land should be harrowed to break up the clods and leave as few hiding places as possible for the moths. For the same reason all weeds and all plants of the potato kind, such as nightshade, ground cherries and similar weeds, should be destroyed over large areas surrounding the potato field. The Department urges growers of potatoes to cooperate in this general work and thus lessen importantly the numbers of the moths and reduce their chances for propagation. It is believed that if general cooperation can be secured it will be possible to stamp out this insect pest. Any slipshod method of raising potatoes at this present time is regarded as particularly dangerous because of this moth, and the specialists urge growers in infested districts to choose some other crop rather than to raise potatoes in a careless manner. Unless protective and defensive measures are adopted at once there will be a serious reduction of the potato crop.

McARTHUR BROS. AWARDED CONTRACT

MacArthur Brothers Company, contractors, of New York, have been awarded the contract by the United States Government for the construction of the Sun River Irrigation Project in Montana. Upon submission of the bids, about May 1st, the Interior Department caused a thorough investigation to be made of the Sun River Project before fully determining whether the same should be completed, and the department finally decided in favor of its completion. The Sun River Diversion Dam is now under construction by Government force account.

The present contract awarded will complete the project and consists of the construction of about 45 miles of main canal and several small tunnels aggregating about three-quarters of a mile in length, the cost of which will aggregate about \$900,000. This canal will have a capacity of 1,700 acre feet per day, and will have a width of 27 feet, a water depth of 11 feet and a top width of 69 feet. All the engineering details were arranged by Mr. H. M. Savage, supervising engineer, for the Government.

MacArthur Brothers Company expect to sublet a large portion of this work and have opened a temporary office at Great Falls, Montana, and subsequently will probably open a permanent office at Gilman, Montana.

Cedarville, N. J., August 12, 1913.

Mr. D. H. Anderson,
Chicago, Ill.
My Dear Sir:

I am a subscriber to THE IRRIGATION AGE and get much valuable information from it in each issue, but I am especially interested at present in getting all the information I can secure regarding "Overhead Irrigation." I never find anything in your magazine concerning that form of irrigating. Will you kindly tell me if you know of any magazine published dealing mostly with that kind of irrigating; also give me list of books on the subject and where I can obtain them and the names of firms who have the different overhead systems for sale.

Thanking you very much for this information in advance, I am

Very truly yours,

L. M. OGDEN.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics add \$2.50 to above price.

A NEW ADVERTISING MANAGER FOR THE INTERNATIONAL.

F. W. Heiskell to Direct Its Future Advertising Policies.

It has been announced by the management of the International Harvester Company of America that F. W. Heiskell, for two years assistant advertising manager, will succeed M. R. D. Owings as advertising manager, and that A. C. Seyfarth, formerly head of the production department, will take the position left vacant by Mr. Heiskell's promotion.

Both of these promotions are along the regular civil service system of advancement laid down by the company in building up its organization.



F. W. Heiskell, Advertising Manager International Harvester Company of America.

Mr. Heiskell began his work in the harvesting machine business twenty years ago, while still a high school boy in Indianapolis, working in the repair room under James B. Heywood, who was guiding the McCormick destinies in Indianapolis at that time. After his graduation in 1895 he was given a permanent position.

He worked his way up from the repair department until in 1905 he was sent to Fort Wayne to be assistant to J. W. Wisheart, who was the International general agent at that place. The following year he was sent to Akron, Ohio, to establish a transfer agency, using the Buckeye plant recently purchased by the International Harvester

Company from the Aultman-Miller Company. In 1907 he went to East St. Louis to establish a transfer and distributing house for the southwest territory, for the purpose of relieving the congestion at Kansas City. He was later made assistant general agent at Indianapolis under "Jess" Everson, which position he was holding when he was transferred to the Chicago headquarters to be assistant advertising manager.

Mr. Seyfarth has been identified with the advertising department of the International since its formation in 1903. Beginning as a catalogue writer, he has gradually gone ahead, until the last few years he has had charge of the production department, which issues catalogues, folders, calendars, the I. H. C. Almanac and Encyclopedia, and other literature. He is a University of Michigan man.

Both Mr. Heiskell and Mr. Seyfarth are well known to the trade. They possess the confidence and esteem not only of the fellow members of the International organization, but of the farm machine world in general.

A LARGE PART OF ROAD BUILDING FUNDS WASTED.

The Office of Public Roads of the Department of Agriculture is making a strong effort to focus the mind of the country on the fact that maintenance and effective repair are of equal importance with the actual improvement of bad roads. Investment of money in new roads does not become real economy until provision is made for keeping these new roads in condition after they are built. If a new road was built and then allowed to fall into disrepair, much of the original investment is simply wasted.

Europe, generally speaking, is ahead of the United States in the matter of road improvement, but Great Britain is struggling with a problem similar to the one that confronts the people of the United States. In England, Scotland and Wales there are no fewer than 2,140 separate authorities who between them, administer 175,487 miles of roads, or an average of only 82 miles apiece. In Scotland, apart from the big cities there are over 200 burghs, one-half of which have but 10 miles of road apiece to maintain. Needless to say, such a minute mileage is insufficient to keep the road plentifully occupied all the year around, and renders the employment of a skilled engineer impossible for economical reasons.

Statisticians have found that although the average expenditure on the improvement of roads exceeds one million dollars a day, a large portion of the money in the United States is wasted because of the failure to build the right type of road to meet the local requirements or the failure to provide for the continued maintenance of the improvement.

The various states and counties within the past six months have taken a greater interest in road improvement than ever before in the history of the United States, and there is now a strong movement to conserve the roads of the country where they are improved. Scientific maintenance will be one of the chief features of the work of the Office of Public Roads throughout the present year.

HOME-MADE COOLING VAT.**Inexpensive Iceless Refrigerator for Country Use.**

Many country homes which cannot have ice must depend on other means for keeping milk, butter and farm products cool. Nothing is better and



Cooling Vat, Showing Pipe Attachments and Submerged Rack for Milk Cans.

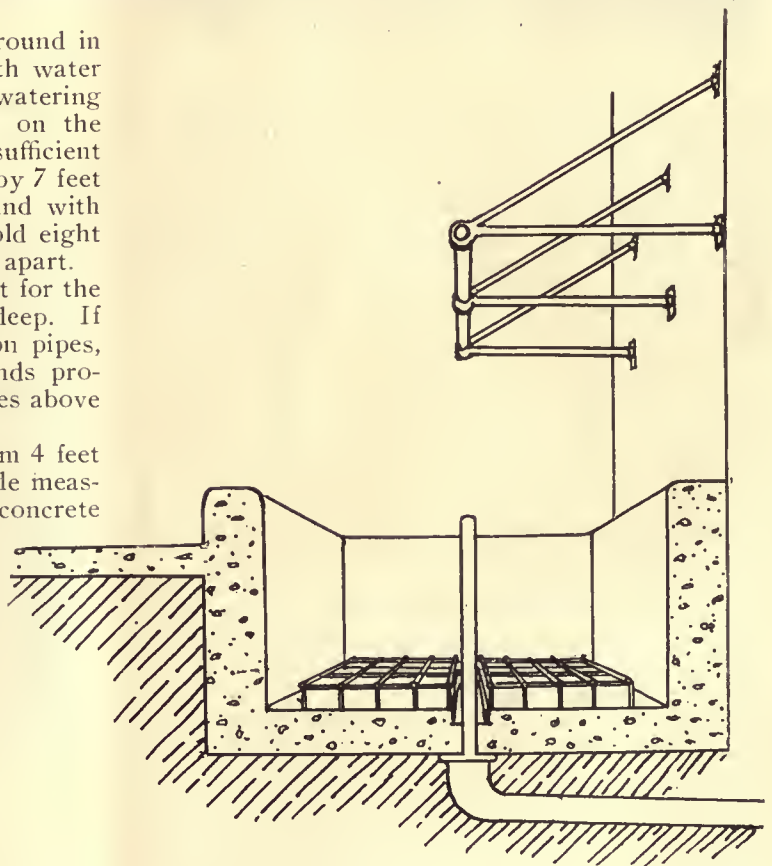
cleaner than a concrete vat sunk in the ground in the milk house and fed by a spring or with water from the well on its way to the stock watering tanks. The size of the vat is dependent on the needs. For a farm with a small dairy, sufficient space is to be had in a tank 4 feet 2 inches by 7 feet 2 inches in the clear, by 23 inches deep and with 5-inch walls and bottom. This vat will hold eight regulation shipping cans spaced six inches apart.

In a corner of the milk house dig the pit for the vat 5 feet wide, 8 feet long and 22 inches deep. If the water is to be fed and removed by iron pipes, these should be laid at once with their ends provided with screw or sleeve couplings 5 inches above the earth bottom of the pit.

Build a box form without top or bottom 4 feet 2 inches wide by 7 feet 2 inches long, outside measurements, and 23 inches deep. Mix the concrete mushy wet of 1 bag of Portland cement, 2 cubic feet of sand and 4 cubic feet of screened gravel or crushed rock, or 1 part cement to 4 parts pit gravel. Place a cork in the ends of the pipes and lay the 5-inch bottom with a strip of woven wire fencing in the concrete within 2 inches of the top. Quickly finish the bottom smooth with a wooden float and a steel trowel and at once set the box form in the pit so as to leave a space of 5 inches on all sides. Fill this space with concrete. Around the corners of the tank, near the top and bottom, imbed an old iron rod. Bring the outside walls to full height above floor level by using a width of board along the side and end. Round the edges and finish the top of the walls with a trowel.

When the tank is two days old, carefully remove the forms. Rub down the walls with a soft brick and paint them with a creamy mixture of cement and water. Five days later the vat may be used. In the coupling of the outlet pipe, place a section of over-flow pipe 19 inches long, which will draw off the warm water at the top of the tank. The overflow pipe should be at least $\frac{1}{2}$ -inch greater in diameter than the inlet pipe so as to remove all danger of flooding the milk and dairy house. Make a grating of 1-inch slats or gas-pipe to place on the bottom of the vat to provide a circulation of cool water under the milk cans. As an aid in lifting the cans, fix a hand-rail at a convenient height above the tank.

For this vat there will be required $1\frac{1}{2}$ yards of crushed rock or screened gravel, $\frac{3}{4}$ yard of sand and 10 bags of cement at a total cost of about six dollars. Two men can build it in one day. Larger cooling tanks should have walls 6 inches thick. Filled with cool water from the spring or well, such a vat will keep the cream sweet and will in many other ways take the place of an ice refrigerator.



Construction Details of the Concrete Cooling Vat.

RENEW YOUR SUBSCRIPTION PROMPTLY.

Do not delay to remit One Dollar for renewal of your subscription to THE IRRIGATION AGE. You cannot get along without it.

WESTERN WATER CO. PUMPING PLANTS

Every day marks the completion of a new project for the benefit of mankind. Great and small, they are chronicled and criticized. The description of one great achievement worthy of comment is here given.

Prompted by the urgent need of the oil fields, Mr. C. B. Colby, of Bakersfield, Cal., conceived the plan to organize and promote a corporation to sup-



Pumping Station No. 1, Western Water Co., Taft, Calif.

ply water for boiler, drilling and domestic purposes, to the largest oil field in the world, known as the "Midway."

This field was at that time being supplied with boiler and drilling water from deep wells situated near Maricopa, Twenty Five Hill, Fellows, and McKittrick. This water contained so much sulphur and salt that it could not be used for domestic purposes.

The Kern Midway Water Co. furnished the domestic water and transported it in tank cars 48 miles from Kern City. This water sold in the fields for 20 cents a bbl.

The Kern Midway Water Co. sold water to the Twenty Three and the Rail Road Water Co., who in return distributed it through small pipe lines to their various customers.

This inadequate and expensive system of water supply caused the expenditure of thousands of dollars that are now saved to the operators; often the water bill of an operating oil company was more than double its monthly pay roll.

Because of the conditions just described several unsuccessful attempts were made to supply the field with additional water.

One notable among them being a plan to bring water down from the mountains on the South, a distance of about 40 miles, through a pipe line. This was abandoned on account of its engineering difficulties, which made the cost almost prohibitive.

In March, 1911, Mr. Colby secured the East $\frac{1}{2}$ of Section 5-31-25, about $1\frac{1}{2}$ miles from Buena Vista Lake and near the point where the Kern River turns to run into the lake and about 12 miles

from the oil fields, and he immediately interested oil operators throughout the fields. A test well was drilled and pumped continuously for 6 days to establish, without a doubt, the quantity and quality. Water suitable for both domestic and boiler purposes was found in abundance.

A corporation known as the Western Water Company was organized with the following officers and directors: C. B. Colby, president and general manager; Fred H. Hall, vice-president; Ira Hochheimer, secretary; T. M. Young, assistant secretary, and Walter A. Fischer, engineer.

Stock sold rapidly and soon ample funds were secured to insure success of the venture.

The plan was to install pumping machinery of sufficient size to pump 2,000,000 gallons per day to a storage tank on the highest hill in the field known as Twenty-Six Hill and distribute by gravitation.

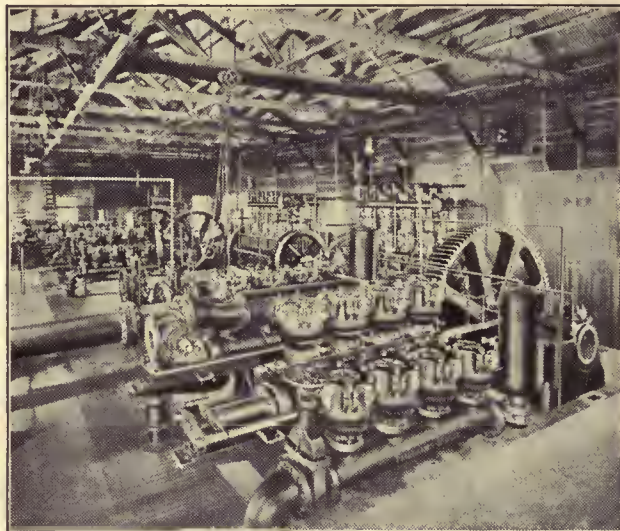
In July, 1911, the company ordered $12\frac{1}{2}$ miles of 12-inch, 49-lb. plain end pipe from the National Tube Company, and sufficient pipe had been received by October 1, 1911, to enable them to commence laying it.

This pipe is coupled with Dayton couplings, a style of coupling consisting of a body ring and two ring flanges, through which bolts are fitted and when drawn up, compress a ring of packing against the outside surface of the pipe, thus making a perfectly water tight joint.

The use of this type of coupling facilitates repairs in case of leakage or damage to pipe line due to wash-outs, caused by heavy rains in the hills.

Pumping machinery for the two stations was ordered in July and arrived in September, 1911.

Station No. 1 is located near the water wells on Section 5-31-25, and the machinery consists of two-



Three 250 H. P. Fairbanks-Morse Gas Engines and Connected to Three 9x18 F. M. Valve Pot Power Pumps.

No. 7 Layne & Bowler vertical turbine pumps, the capacity of each is about 2,000,000 gallons per day. These two pumps are driven by one 50 horsepower Fairbanks Morse single cylinder horizontal type engine for pump in well No. 5 and one 80 horsepower Fairbanks-Morse 3 cylinder vertical gas engine, type "R. E." heavy duty for pump in well No. 7.

The elevation at the surface of the ground where these pumps are installed is 297 feet above sea level. When not being pumped, the water in the wells raises and runs over the top of the casing. When being pumped to the full capacity of the pumps, the water is lowered only about 58 feet.

The water from these pumps is discharged into two 10-inch pipes which connect to Y branches on the 14-inch discharge line leading to the concrete reservoir 672 feet distant.

The reservoir is 40x100 feet x5½ feet deep, divided into two basins 40x50 feet so that one side can be emptied and cleaned, without interrupting the water supply.

The water first enters a sand box or settling basin before flowing into the reservoir, which prevents sand and silt from entering the 20-inch suction pipe leading to the 9x18 F.-M. power pumps in the main building. The elevation on the floor of this building is 310½ feet. Water is thus supplied to the pumps under slight pressure.

The equipment in the main building consists of 3-9x18 Fairbanks-Morse Pot Valve Power Pumps, direct connected to 3-250 horsepower Fairbanks-Morse Four Cylinder Vertical Engines, Type R. E. heavy duty.

The gas for use in these engines is supplied from the Taft to Bakersfield pipe line of the California Natural Gas Company.

The pumps are fitted with 10-inch discharge pipes which connect to the Y branch fittings on the 12-inch main line to Station No. 2 in Taft.

Each pump is fitted with a relief valve set at

SHEEP USED TO TRAP SPOTTED FEVER TICKS.

The free grazing of 2,500 head of sheep upon the Bitterroot national forest, in the state of Montana, has been authorized by the Secretary of Agriculture as part of a novel experiment in trapping the deadly spotted fever tick. The forest service and the public health service are working together



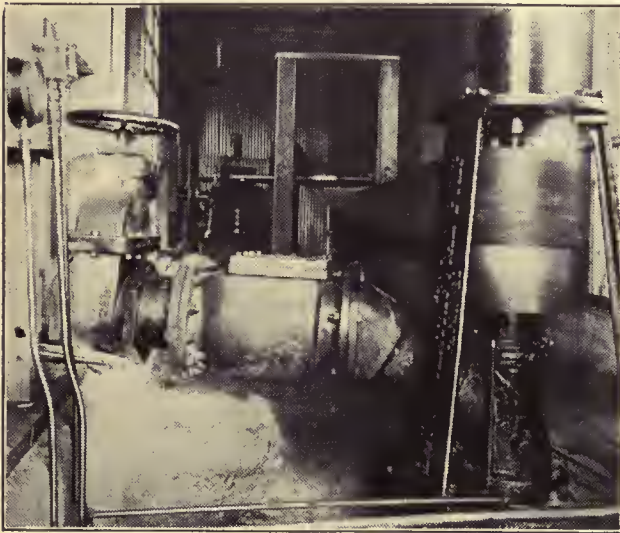
Three 100 H. P. Titusville Tubular Boilers and Two 18x11½x18 Fairbanks-Morse Duplex Valve Pot Pumps.

in co-operation with local sheep growers in this new campaign.

It is the general belief of the leading medical authorities that the mysterious and frequently fatal disease commonly known as spotted fever is spread by the tick *Dermacentor Andersoni* which, in parts of the Bitterroot forest, occurs in such abundance that it constitutes a real menace to man and beast. Surgeon McClintic, of the public health service, died last year of spotted fever contracted during his study of the disease and its control.

The plan proposed contemplates the grazing of two bands of sheep upon the parts of the forest where the tick is most abundant, with the idea that large numbers of the ticks will attach themselves to the sheep. Then, as occasion requires, the sheep will be freed of the ticks by being dipped in an insecticide solution which will kill the ticks without in any way injuring the sheep.

The engorging of the female tick with blood is one of the essential functions of reproduction, and this gorging must of necessity take place upon the larger mammals which serve as hosts to the tick. The United States Biological Survey has reached the conclusion that the great bulk of the fever ticks which become filled with blood get their supply while attached to domestic stock, and that if the domestic animals are freed of ticks by dipping, by spraying, or by some other effective method of treatment, the chances of the infection of human beings will be vastly reduced. Of the different domestic animals the sheep is the most readily handled and the easiest to dip or treat, hence the selection of sheep for use in the experiment.



No. 7 Layne & Bowler Vertical Turbine Pump, Driven by a 50 H. P. Fairbanks Horizontal Oil Engine.

550 pounds. The line pressure when plant is in operation being from 500 to 525 pounds per square inch, 300 pounds of which is static and 200 to 225 pounds caused by friction in the pipe. There are also 4 alleviators on the main line at this point to take care of any water hammer that may occur.

All Y branches, gates and other fittings were placed in pipe line and tested to 1,000 pounds per square inch hydraulic pressure.

GOOD COUNTRY ROADS PAY FOR THEMSELVES.

The Department of Agriculture Collects Data Showing That Land Values Increase in Actual Value After Road Improvements.

The direct effect that changing bad roads into good roads has upon land value and the general economic welfare of a community is shown in several concrete illustrations gathered by the U. S. Department of Agriculture. The Department has just issued a statement on the subject, based upon a mass of information gathered by the Office of Public Roads, which is making a special study of the economic effect of road improvement in the country. According to data gathered, where good roads replace bad ones, the values of farm lands bordering on the roads increase to such an extent that the cost of road improvement is equalized, if not exceeded. The general land values, as well as farm values, show marked advances, following the improvement of roads.

Among the illustrations cited by the Department are the following:

In Lee County, Virginia, a farmer owned 100 acres between Ben Hur and Jonesville, which he offered to sell for \$1,800. In 1908 this road was improved, and, although the farmer fought the improvement, he has since refused \$3,000 for his farm. Along this same road a tract of 188 acres was supposed to have been sold for \$6,000. The purchaser refused the contract, however, and the owner threatened to sue him. After the road improvement, and without any improvement upon the land, the same farm was sold to the original purchaser for \$9,000.

In Jackson county, Alabama, the people voted a bond issue of \$250,000 for road improvement and improved 24 per cent of the roads. The census of 1900 gives the value of all farm lands in Jackson county at \$4.90 per acre. The selling value at that time was from \$6 to \$15 per acre. The census of 1910 places the value of all farm lands in Jackson county at \$9.79 per acre, and the selling price is now from \$15 to \$25 per acre. Actual figures of increased value following road improvement are shown.

As the roads in no way effect soil fertility or quality of the farm, advances are due essentially to the decrease in the cost of hauling produce to market or shipping point. Farms are now regarded as plants for the business of farming, and any reduction in their profits through unnecessarily heavy costs for hauling on bad roads naturally reduces their capitalization into values. With reduced costs for hauling, profits are increased; with the result that the farm plant shows satisfactory earnings on a higher capital value.

The automobile also has begun to be an important factor in increasing rural values where good roads are introduced.

Immigration is particularly marked where road conditions are favorable; in fact, the figures of the department seem to indicate that good roads indirectly increase the demand for rural property; and the price on farm land.

STOCKMEN PARTICIPATE IN MANAGEMENT OF NATIONAL FORESTS

During the past fiscal year, according to a report of the U. S. forest service, 31 local organizations of stockgrowers using national forest ranges have applied for and secured the official recognition of their advisory boards by the forest service. This brings the number of associations officially recognized by the forest service to a total of 115.

Through the medium of these advisory boards several thousand stockmen who graze stock upon the national forests now take an active part in discussing all problems of forest administration which affect their interests. The result, states the forest service report, has been the elimination of misunderstanding regarding the requirements of the stock interests and an improvement in methods of range control which has won the endorsement and approval of the large majority of the persons who depend upon the national forests for the pasturage of their stock.

Two of the stockmen's associations are national in their scope and one is a state organization. The remaining 112 are local organizations. The stockmen have, it is said, been successful in securing advisory boards composed of broadminded, unselfish men of wide practical experience who have worked for the best interests of their industry but at the same time have given intelligent consideration to the need for forest protection, and who therefore have directed their recommendations along constructive lines.

The recent order of Secretary Houston extending official recognition to organizations of other classes of forest users is said to have resulted mainly from the large measure of success won by the co-operation of the government with the stockmen.

It has been discovered that the waste from dogwood shuttle-blocks can profitably be made into handles for steel knives and forks.

Contrary to popular belief, forest fires seldom travel more than 2 or 3 miles an hour. Even in extreme cases it is questionable whether they burn at a rate of more than 6 to 10 miles an hour.

Uncle Sam's forest rangers require that permanent camp sites within the forests shall be kept in sanitary condition. The ubiquitous tin can must be buried, and waste paper burned when a camp is left.

More than 3,000* small logging operators now buy national forest timber; at least 25,000 persons, settlers, miners, stockmen, and others, obtain timber from Uncle Sam's big woodlot for their own use free of charge.

The forests of Corsica, the little island upon which Napoleon was born, are managed by the French government. They produce lumber, firewood, and turpentine, and all parts of the tree are far more closely utilized than in America.

Send \$1.00 for 1 year's subscription to the IRRIGATION AGE and bound copy of THE PRIMER OF IRRIGATION. If you desire a copy of The Primer of Hydraulics, add \$2.50 to above price.

DEMAND FOR ARIZONA BEEF.

The roundup of cattle in southern Arizona continues from the early part of April until the end of May. Now the stock are being put on pasture and on heavier feed ready for the California markets. Shipments to California from Arizona reach big figures. Since the stringency a few years ago the improvement in the cattle industry has been very marked. Commercial cattle are 150 per cent higher than following the money shortage. Thoroughbred stock are 50 to 100 per cent higher. The distribution of blooded stock over the ranges, the conservation of ranges and the renewal of range grasses by protective measures have all helped to bring the industry to its present profitable stage.

California's demand for live stock has made big inroads into the cattle supply of Arizona. Over 75,000 head have left Arizona for Los Angeles and southern California during the past year. Prices have ruled high and the business is on a very pros-

perous basis. The great ranges in Arizona are being administered very carefully. No overstocking has been allowed and the result has been a betterment of feed and general conditions. Good weather conditions have helped to bring about a renewal of range grasses, there have been liberal rains and in winter snow. Growing alfalfa has been undertaken by stock owners. The large companies are interesting themselves in farm lands where irrigation is practiced. The voluminous crops of alfalfa in the Salt River Valley are in great demand for putting on the finishing touches to great bunches of range stock. Pasturing the cattle on the alfalfa fields in winter is very advantageous in many ways.

Grain crops are fed back in winter and in proper time they reach maturity and are vigorous and healthy crops. Root crops are not grown extensively for stock purposes, but the residue from 3,000 acres of sugar beets, beet pulp and tops are used for stock feeding. Large acreages of milo maize, sorghum, kaffir-corn and shallu are raised for stock fattening. The live stock owners through Arizona are appreciating the value of reserve feed. Great

LITTLE DUTCHMAN ONE-MAN TRACTOR GANG.

We are showing in this issue the Little Dutchman One-Man Tractor Gang Plow. This plow is built in two styles, the regular and special deep fur-



One-Man Tractor Gang Plow.

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row—either of these styles are furnished with plain or friction brake beams and either may be equipped with automatic power lift attachment as shown in half tone.

This One-man Tractor Gang is built in gangs of four plows each. The fourth plow may be removed, making a three-plow gang.

These gangs may be coupled in rigs of two or three plows, making either a 6, 7, 8, 9, 10, 11 or 12 bottom outfit.

One feature of especial importance in the equipment of this plow is the power lift by means of which the operator, without leaving his seat on the engine, raises and lowers the plow any desired amount simply by pulling one or the other of the cables.

Full information concerning this outfit and all other goods made by the Moline Plow Company may be obtained from a large, finely illustrated almanac which will be mailed free of charge to all who write The Moline Plow Company and who state that they learned about it through THE IRRIGATION AGE.

Reclamation Notes

CALIFORNIA.

The State Reclamation Board of California, has been reorganized under the provisions of the act of the Legislature generally known as the Shinn Bill. The act increases the membership of the board from three to seven.

The new act adds to the territory over which the board holds jurisdiction over half a million acres in the San Joaquin valley, making the entire acreage of the reclamation district thus legally created over a million and three quarters. It increases also very much the powers and duties of the board, giving it jurisdiction over reclamation and reclamation work in fourteen counties in the basins of the Sacramento and San Joaquin rivers somewhat similar to that exercised by the State Railroad commission over public carriers and their business.

The act definitely recites that the People of the State of California have a primary and supreme interest in having erected and maintained throughout the basins named levees and embankments properly protecting the lands subject to overflow, and to that end in carrying into effect the plans of the California Debris Commission for flood control of the Sacramento and San Joaquin rivers. These plans, as modified by the report of February 8, 1913 have been approved by the Army engineers on Rivers and Harbors.

The Alta Irrigation District has filed suit against John A. Rogers, *et al*, seeking to prevent the defendants from obstructing the water flow into the Alta irrigation ditch as it comes from Kings River. It is the claim of the plaintiffs that for years they have been taking water from Kings River by way of Cameron slough, a natural waterway from the river. The water has been used over thousands of acres in the Alta district near Dinuba. The defendants, according to the complaint, have opened the bank of Cameron slough and are damming up the intake of the Alta canal with the intent of taking the water away to their own lands. A temporary injunction has been secured while the matter is being heard.

Articles of incorporation have been filed by the Big Springs Water Company, having their principal place of business at Montague. The purpose of the company will be to promote irrigation in the Mayten district, the water to come from Big Springs. The company has two flowing wells, enough to irrigate several hundred acres of land.

A special assessment of \$75,000 for the repair and improvement of the upper works of the Modesto Irrigation district has been levied by the board of directors of the district and will be included in the next tax levy. The money is needed for the replacing of several flumes with hydraulic fills. Another important action was taken by the board in regard to the distribution of water. One of the changes will relate to the time for watering trees and vines.

Under the present rule this cannot be done later than September, but hereafter it will be allowed until late in the fall.

There are 75,000 acres of alfalfa, which are growing in the Turlock irrigation district, estimated on the basis of an average yield of six tons to the acre and on a selling price of \$10 per ton. The district total crop approximates a value of \$4,500,000.

The largest yield of currants on record in California has been marketed from the orchards of D. M. Denison of Tehachapi during the past summer. A few years ago he started the growing of currants as a crop between the rows. He is said to be making from \$200 to \$800 per acre on this between-the-rows crop.

Truck crops in and around Live Oak are taking the place of growing fields of wheat, which grew there in years past. Many of the farmers have planted vegetables and the yield will make this section an important supply point for the wholesale supply of garden truck.

The installation of pumps and motors for the irrigation system of the Big Spring Water Company is about completed.

The farmers of Riverbend county are greatly elated over the report and order of the State Railroad Commission in the irrigation hearing held recently, whereby a temporary order has permitted the turning of the water in the ditch to the full head. Many of these people are getting their first water for irrigation this season.

C. H. Glenn plans to irrigate his 1,000-acre ranch in the river section of Glenn county. Water will be obtained from the Sacramento river and wells which will subsequently be sunk.

B. J. Twilling, manager of the Tisdale ranch, intends to put the entire ranch of 2,800 acres, near Meridian, under irrigation.

The first of the pumps of the Mt. Shasta Land & Irrigation Company, a San Francisco corporation of which C. M. Starkweather of Sacramento is president and George W. Pelspier a director, was started recently at the Big Springs, and lowered the water in that basin but two inches. The pump raises 400,000 gallons an hour to a height of 56 feet and forces the water through 2,000 feet of 24-inch steel pipe. This with another pump which is expected will soon be installed will furnish water for several thousand acres of desert land which will when irrigated grow some of the finest alfalfa in the State of California.

NEVADA

Farmers in the Truckee groups, representing all of the large ditch owners of the valley, have decided to enter into a rotation system of irrigation, as was done last year. This will mean water for all, and will also result in more water for the Truckee-Carson project.

COLORADO.

Contract has been executed by the Interior Department with the D. & R. G. Railroad Company granting to the Government right of way through the Canyon of the Colorado River for the main canal of the Grand Valley irrigation project, Colorado. This canal will parallel the river and occupy a portion of the railroad right of way, crossing the tracts in one place.

The Secretary of the Interior has awarded contract to Ellsworth Klaner Construction Company, of Pittsburgh, Kansas, for the construction of a portion of the East Canal, Uncompahgre Valley irrigation project, involving approximately 88,000 cubic yards of excavation in open cut, and 5,500 cubic yards overhaul. The contract price is \$16,572.50.

The Secretary of the Interior has authorized the Reclamation Service to construct the diversion dam and appurtenant structures for the Grand Valley irrigation project, Colorado. The work will begin at once in order to take advantage of the present low water season. It is estimated that it will cost approximately \$375,000.

The Secretary of the Interior has authorized the Reclamation Service to award contract to the Hinman Hydraulic Manufacturing Company of Denver, Colorado, for furnishing sluice and penstock gates for the Elephant Butte dam, Rio Grande irrigation project, New Mexico. The contract calls for two pairs of sluice gates, six penstock gates and accessory parts. The amount of the contract is \$47,693.

IDAHO.

The Secretary of the Interior has approved the expenditure of \$20,600 in installing a scoop wheel and for the extension of the lateral system on the Minidoke irrigation project, Idaho, to pump water to 1,000 acres of land above the gravity system. The necessary works are known as A-4 Raise and 212 Extension.

The Secretary of the Interior has directed the Reclamation Service to execute contract with the Minneapolis Steel and Machinery Company of Minneapolis, Minnesota, for furnishing semi-steel discharge pipe for balancing valves for the Arrowrock dam, Boise irrigation project, Idaho. The contract price is \$19,420.42.

The Secretary of the Interior has awarded contract to the Standard Underground Cable Company of Los Angeles, California, for furnishing wire for transmission lines in connection with the Boise irrigation project, Idaho. The contract amounts to \$5,834.05.

The Secretary of the Interior has authorized the Reclamation Service to purchase 36 gravel cars at not to exceed \$250 each for use in connection with the work on the Arrowrock dam, Boise irrigation project, Idaho.

MONTANA.

The Secretary of the Interior has authorized the Reclamation Service to execute contract with MacArthur Brothers Company, of New York, for the construction of the Pishkun Reservoir Supply Canal and tunnels and Sun River Slope Canal of the Sun River irrigation project, Montana. The work involves the excavation of 2,400,000 cubic yards of material and the construction of 3,215 linear feet of concrete lined tunnel. The contract price is \$658,615.

The Director of the Reclamation Service is asking for bids for the construction of about 53 miles of canals and laterals involving the excavation of approximately 366,000 cubic yards of material, in connection with the Flathead irrigation project, Montana. The work lies between five and twelve miles southwest from Polson. Proposals will be opened at St. Ignatius, Montana, on September 30, 1913.

The Director of the Reclamation Service is asking for proposals for earthwork and structures on the second unit of Dodson North Canal, Milk River irrigation project, Montana. The work consists of laterals and waste water ditches involving about 300,000 cubic yards of excavation, 1,200 cubic yards of reinforced concrete, the placing of about 100,000 pounds of steel reinforcement and the placing in wooden structures of about 140,000 feet B. M. of lumber. The work is situated on the north side of Milk River, adjacent to the main line of the Great Northern Railway in the vicinity of Wagner, Exeter and Malta. The bids will be opened at the office of the United States Reclamation Service, Malta, Montana, August 6, 1913.

OREGON.

In conformity with the policy announced early in his administration of encouraging a larger co-operation between the states and the Federal government in all matters relating to the reclamation of arid lands and the conservation of our natural resources, Secretary Lane today authorized the Reclamation Service to enter into an agreement with the state of Oregon to co-operate in the joint construction of an irrigation project in that state. It is understood that the state of Oregon has appropriated \$450,000 to be used in completing a portion of the project formerly known as the Columbia Southern Carey Act project, but now called the Tumele project, where private enterprise had failed. It developed that the project, including as a whole 35,000 acres, may be completed if a like amount of money is appropriated from the reclamation fund.

The proposal for co-operation is the direct outcome of a plan suggested last September by the Oregon Conservation Commission and endorsed by the governor of the state. In its letter to the Department the Commission called attention to the fact that the situation in the Deschutes Valley is such that the fullest development of the irrigation and water power possibilities demands concerted and comprehensive action by both state and federal authorities. Under a co-operative agreement between

the State and the Department of the Interior, the sum of \$100,000 equally divided has been appropriated for the necessary investigations and surveys which are now in progress. Under the determination of the engineers that the proposed project is feasible and presents no insuperable legal obstacles, Secretary Lane has agreed to ask the President of the United States to set aside from the fund a sum not to exceed \$450,000 which with the appropriation of a like sum from Oregon is to be used by the Reclamation Service to develop the whole project.

TEXAS.

A syndicate of St. Louis men which includes H. P. Hilliard, George D. Barnard, Lloyd Schock, George T. Sands, and several others, is preparing to colonize with farmers a tract of 60,000 acres of land which they own, situated near Harlingen.

Articles of incorporation have been filed by the Winter Garden Irrigation Company; capital stock, \$100,000; principal office, San Antonio.

C. E. Spath is putting in an extensive irrigation plant on his land nine miles west of Stanton. He has a well that will pump perhaps 1,500 gallons of water per minute with a depth of only about 15 feet, and he hopes to have some of this land under irrigation this season.

J. W. Malone of Decatur, Texas, has purchased 30,000 acres of land in Kinney county, near Fort Clarke. Mr. Malone will install an irrigation plant and put in small farms. The Losmoras river runs through a part of the property.

UTAH.

The Secretary of the Interior has authorized the Reclamation Service to award contract to the Utah Coal Sales Agency, Salt Lake City, Utah, for 5,000 tons of "Hiawatha" coal for use in connection with the work of construction of the Arrowrock dam, Boise irrigation project, Idaho, for one year from the date of contract. The total cost is \$5.95 per ton delivered.

The Secretary of the Interior has authorized the Reclamation Service to approve a contract with C. F. Dixon, of Payson, Utah, for hauling general freight in connection with the construction of the Strawberry Valley irrigation project in that state. The contract calls for the hauling of not to exceed a total of 700 tons at \$11 per ton.

WYOMING.

Upon request by the president of the Water Users' Associations the Secretary of the Interior has issued an order that in view of the exceptional requirements regarding operation and maintenance payments during the current year on the North Platte irrigation project, Nebraska-Wyoming, due to the postponment of payments in former years, water will be delivered during the current irrigation season without immediate payment of the charges due for operation and maintenance. On

account of this postponment, however, there shall be an increase as suggested by the association, in the charges of one cent per acre for each month which elapses in whole or in part from July 21, 1913, to the date of payment. This additional charge shall be separately added to each portion of an installment for operation and maintenance remaining unpaid on and after July 21, 1913, so that those who owe portions of installments for O. & M. for two years will be required to add to the amount of two cents per acre per month or fraction of a month.

WASHINGTON

Approximately 45,000 acres of desirable irrigated land in Washington will be offered for a long time lease or sale by the interior office at Washington. These lands have good water rights, and are located in a fertile portion of the state.

The Secretary of the Interior has approved a contract between the United States and the State of Washington for co-operation between the state and the government in making surveys and investigations estimates to determine the feasibility of the Palouse irrigation project.

The contract provides that surveys and investigations shall be made following the general plan of operation agreed upon between the Governor of the state and the Reclamation Service, that all field notes, original plans and other data shall be filed with the U. S. Reclamation Service, a copy being furnished the state if application therefor is made, conclusions and recommendations to be agreed upon jointly by the Governor and the officers of the Service having jurisdiction, or in the event of failure to agree, that each shall submit separate conclusions and recommendations to be embodied in the report and published. In carrying out the work under the contract, one-half the expense shall be borne by the state and the other half by the United States, the total expense of each not to exceed \$10,000.

MISCELLANEOUS.

The Secretary of the Interior has authorized the Reclamation Service to award contract to the Pittsburgh Testing Laboratory for inspection and testing work for the ensuing three years. The amount of work to be performed under the contract cannot be determined in advance, as inspection depends entirely upon the amount of machinery and material subject to inspection required as the needs of the Service develop.

The Buffalo, N. Y., Park Department, under the direction of a city forester, has been for several years setting out young trees on new streets, a score of streets being attended to each spring and fall. This summer being unusually dry, the trees set out in the last two or three years were observed to be in poor condition, and owners of premises have been advised to give the trees plenty of water.

The park department has gangs of men on the streets, attending to trees in front of vacant lots. One man with a soil fork loosens the soil about the

trees to a depth of several inches, and is followed by a sprinkling cart to which is attached a hose without a nozzle, and water is poured into the loosened soil as long as the soil will absorb it.

It is announced that the government will immediately begin the work of enlarging and extending the north main canal of the Belle Fourche irrigation project in South Dakota. Twenty miles of laterals will also be constructed in connection with this work. The extension will irrigate several thousand more acres of land.

The completion of the Nile dam at Assuan, Egypt, is one of the most important and daring works of modern engineering. The design of the work and the choice of the site are due to Sir William Willcocks.

The first steam plow to operate on the government's Shoshone (Wyo.) project, the ditches of which will eventually reclaim 150,000 acres, is breaking ground near Powell.

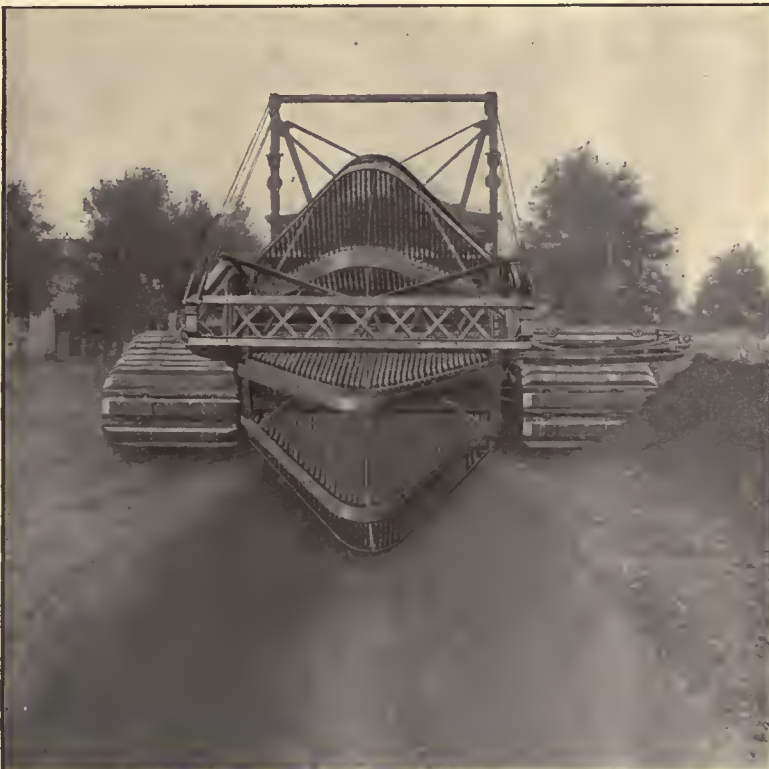
The Federal Reclamation Service is ready to begin development of the Lawton (Okla.) irrigation project as soon as local requirements are met, according to dispatches recently received from Washington, D. C. The department requires mortgage contracts from the farmers to be benefited, guaranteeing the return of the fund expended and an agreement from the city of Lawton to permit the use of the city reservoir for water supply.

Using his 150-ton silo as a storage reservoir for water to irrigate his farm with is the latest use to which silos have been put in Oklahoma or any other place. While gathering silo information for the July issue of the *Southwest Trail*, of which he is the editor, Victor H. Schoffelmayer came across William Cotter, a farmer near Enid. He has a 150-ton steel silo which rests on a base of concrete and is water tight. He filled it last fall with kafir, which he fed to his cattle, and this spring when the silo was empty Mr. Cotter gave it a good coat of paint inside and outside, and will use it for storing water.

In view of the representations made at the recent conference of the Water Users' Associations in Washington, D. C., and recognizing that the low prices for farm products in 1912 have rendered it difficult for many settlers to meet their obligations to the Government, Secretary of the Interior Lane has issued an important public notice to all settlers on national irrigation projects.

WE are short of copies of issues of Irrigation Age for April, June and July, 1913. We will pay 15 cents per copy for any of these issues. Send to Irrigation Age, 30 N. Dearborn St., Chicago, Illinois.

MARSH OR DESERT RECLAIMED AT SMALL COST



The South has said goodbye to the hand labor method of reclaiming waste land. Contractors and land owners have found a better way of digging drainage and irrigation ditches—a way that is faster and cheaper, too. They now use the

BUCKEYE OPEN DITCHER

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**THE BUCKEYE TRACTION
DITCHER COMPANY**

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By this order the building charge for the last instalment which became payable is reduced to one-third of the amount due, but not to less than 50 cents per acre; the payment of the balance is to be deferred and added to the last instalment on the water right application. For those who have already paid the charges due a corresponding credit is to be given on the next annual instalment or they may have the credit applied to the operation and maintenance charges now due.

No person is to receive the benefit of this concession on December 1 next who has not paid all the amounts due for operation and maintenance and who has cultivated less than one-half of the irrigable area of his land or not less than five acres for each full irrigation season since water was first available for the land.

It is provided further in the case of those who are now delinquent and subject to cancellation that if they make payment of the operation and maintenance charges for irrigating their land, no steps will be taken toward cancellation until December 1, 1913.

The Secretary of the Interior has authorized the Director of the Reclamation Service to execute contract with the Steacy-Schmidt Manufacturing Company, of York, Pa., for furnishing twenty cast iron sluice gates for the Jackson Lake dam, Snake River storage unit, Wyoming. The contract price is \$18,140. This dam was constructed primarily to store water for use on the Minidoka irrigation project, Southern Idaho. By an arrangement with the Carey Act project at Twin Falls, water stored in this reservoir is now also used to supplement the original supply of that project.

Secretary Lane on June 12 vacated and set aside Paragraph 38 of the general reclamation regulations approved February 6, 1913, which limited the right of assignments under the Act of June 23, 1910, to qualify homesteaders, and issued a new regulation which does not contain this restriction.

Former Secretary Fisher had held that under this act which permitted assignments of the whole or part of an entry under a reclamation project after final proof of residence, improvement and cultivation for the period required by law, but before final payment of the reclamation charges, the assignees were limited to persons who were qualified to make entry under the Homestead Law.

This ruling greatly restricted the number of persons to whom assignments could be made and therefore it was very difficult for any entryman to sell his entry or any part thereof.

The new ruling by Secretary Lane makes no restriction except as to the limit of area which is fixed at a maximum of 160 acres by the Reclamation Law, and that the assignment must be a bona fide sale, and also that a husband or wife cannot assign to one another.

Tulsa, Oklahoma, through the Deep Waterways Committee of the Commercial Club, headed by L. J. F. Rooney, is taking a deep interest in the proposition to create a new artificial river through the great arid plains of western South Dakota, Nebraska, Kansas and Oklahoma. The plan was

originated by J. C. Hopper, president of the Citizens' National Bank of Ness City, Kan., and through him a working force has been organized that it is hoped will in the next few years lead to definite action. The plan in brief is to use the Panama Canal machinery to dig a river running from the Black Hills in South Dakota to the Cimarron River in Oklahoma, crossing other rivers on viaducts.

By a threatened change in the course of the Missouri River the Williston federal irrigation station near Williston, N. D., is in danger of being made worthless. Three and a half miles north of Williston the bank of the river has fallen so low that the annual June rise of the river will flow over it into an old backwater channel which will carry the water west and south of Williston about three miles, and this channel would become permanent. The city's water supply also would be cut off.

Williston commercial bodies recently addressed a plea to the United States army engineers at Kansas City asking that immediate steps be taken to prevent the threatened change.

Organization of the Kentucky Overhead Irrigation Company, having a capital of \$150,000, was made public recently with the announcement that the company had purchased from Walter S. Adams and Rush C. Watkins, representing the Farm Land Company, 360 acres of farm land in the Newburg road. The consideration was \$30,000. The land will be divided into ten-acre farms and sold. Irrigation will be supplied through the company's system of overhead pipes, by which ground within a distance of thirty feet on each side is uniformly sprayed.

The new company is similar to concerns of the same name operating in other states. Local capital is interested. The company has been in process of organization for several months.

Several committees appointed by the citizens are busy arranging details for the organization of an irrigation district under the recent district irrigation law, which will be in effect June 30. It is proposed to include about 40,000 acres of land in the vicinity of Barstow, Texas, and construct a large reservoir which will be used for storing water from the Pecos River to supply this land with an abundance of water.

LUTE WILCOX TALKS.

Louis W. Hill of the Great Northern railroad, says he has seen hundreds of settlers on reclamation projects in Oregon waiting wearily for work on irrigation systems to be resumed and declares it is a disgrace to the government that these people have no one to defend them. "The government owes these people a bonus," he says, "and I think it ought to be paid them. The reclamation service has been too slow. There is no hope of reform in its operations as long as incompetent men are at its head. Engineers employed by the service are as competent as any other engineers, but if things do not go Newell's way he cans the engineer who disagrees with him. They had L. C. Hill picked out to succeed Newell. Now Newell is investigating him and trying to drive him out of the service."—*Field and Farm*.

(Continued from page 374)

6. It is interesting to note that the average cost of water from the Government works is about \$12 per acre less than from the recent private works of comparable size. The real difference is still greater because of the fact that deferred payments on Government works do not draw interest.

7. This difference is further accentuated by the greater probability of the water users under the Government projects receiving an adequate water supply, as this matter has been given more careful consideration and deficiency guarded against with greater care than in the private investments. In fact it is known that in a few cases at least there is not water enough for the entire area of land included in these private projects. Also on the Government works provision in many cases has been made for drainage such as has not been provided by the private works and the water is, as a rule, brought nearer to the land to be irrigated; still further reducing the cost to the water user.

8. Summing up all of these advantages—lower first cost, absence of interest, more dependable water supply, and more complete works, it would

appear to be fair to state that water from the Government projects is obtained at from half to two-thirds the cost of that from private works here listed, including those built under the terms of the Carey act.

JOHN T. BRAMHALL—EDITOR.

John T. Bramhall, the well-known agricultural writer, has acquired a half interest in "Alfalfa," a monthly paper published at Modesto, Cal., and has taken editorial charge. Mr. Bramhall was formerly a writer for the old Country Gentleman, and was on the staff of the Albany Evening Journal. In Chicago he was for several years advertising agent of the Michigan Central railroad and going to California he was connected with the colonization department of the Santa Fe. Mr. Bramhall is well posted on agricultural conditions in California and the southwest.

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COST OF MAKING A POUND OF BUTTER.

G. A. Gilbert

Colorado Agricultural College, Fort Collins, Colo.

From an investigation of the annual report for 1912 of seventeen creameries operating in Wisconsin, Michigan and Minnesota, we find that the average cost of making a pound of butter is 2.07 cents. In the same way we find that the average cost in all the creameries in a single county in Minnesota in 1911 was 2.11 cents. This includes fifteen creameries. The greatest variation was from 3.5 cents in a small creamery to 1.1 cent in a creamery making over 500,000 pounds of butter a year. The cost includes salaries, supplies, and all operating expenses of the creamery. It does not include dividends, new machinery, or buildings, cost of hauling cream, or what is ordinarily included in the sinking fund.

The size of the creamery has a great deal to do with the cost per pound of butter. Putting the two groups together we find that in five creameries making less than 100,000 pounds per year the cost was 2.7 cents; in ten making between 100,000 pounds and 200,000 pounds, the cost was 1.99 cents; and in fifteen, making over 200,000 pounds, the cost was 1.82 cents. The type of creamery does not seem to influence the cost greatly.

The creameries were all of the co-operative kind, and would represent average management.



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FOREST NOTES.

Switzerland has four cooperative associations for the growing and marketing of forest products.

The U. S. forest service is using gasoline railway speeders for fire protection purposes. They follow up trains on steep grades where sparks thrown out by forced draft are likely to start fires along the right of way.

Forest officers have found that high power telescopes are not always satisfactory in fire-look-out work. In some localities heat vibrations in the atmosphere are so magnified by the glass that clearer vision can be had with the unaided eye.

At the national conservation congress to be held in Washington, November 18-20, the subject of forestry will be handled by a main committee, with sub-committees which will report on federal and state forest policies, forest taxation, fires, lumbering, planting, utilization, forest schools, and scientific forest investigations.

Elk have been found in the Uinta national forest, Utah, for the first time in many years. Since they are not from shipments from the Jackson Hole country to neighboring forests, the state and federal officials are gratified at this apparent increase in big game, as the result of protection.

Approximately \$30,000, or 35 percent of the government's receipts last year from grazing fees on the national forests of Montana, goes into the state for schools and roads, according to an an-

nouncement by the U. S. forest service. Returns to the government from grazing resources in the state during the year total about \$84,000, of which the counties in which the forests are situated get about \$29,000. This is in addition to receipts of \$177,000 from other forest resources, returning into the state a total of \$90,000.

For the fiscal year ending June 30, 1913, grazing permits were issued on Montana forests for 121,251 cattle, 15,858 horses, 716,191 sheep and 900 goats. Compared with the preceding year the figures show substantial increases for all stock except goats, which show a decrease of 370 head. In all, 2,312 permits were issued, a gain of 42 over the preceding fiscal year, and an increase of 5,570 cattle, 552 horses, and 29,803 sheep for 1912 is shown.

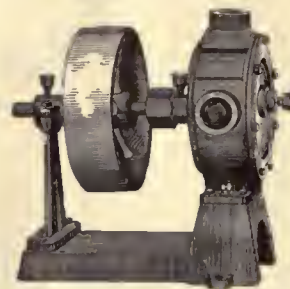
The national forests of Montana contain an abundance of first class summer range, according to the forest service report, but a considerable portion of this range is said to be remote from the spring, fall, and winter ranges and the source of forage supply. For this reason it is not yet stocked to its full capacity, but the government is said to be making a determined effort to secure the full utilization of all forage resources and predicts that within a few years at most the national forest ranges of the state will be stocked to their normal grazing capacity. The ranges now, it is stated, if fully grazed, would accommodate at least 177,000 cattle and horses and 873,000 sheep and goats.

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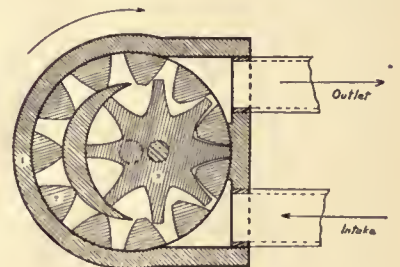
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FOREST NOTES.

The forest service of India has demonstrated that teak wood grown in plantations is just as strong as that grown in natural forests.

Army bayonets now form part of the emergency telephone outfit of forest rangers, used chiefly in fighting fires. This emergency line consists of small instruments and a coil of fine copper wire. The wire is attached to the nearest telephone line, the bayonet is

thrust into the moist ground at the other end, and with the circuit thus completed the ranger can talk with headquarters, report his position, and summon fire fighters if necessary.

The fact that a resurvey of a township has been determined upon and authorized does not make them unsurveyed land and the prior survey is an existing survey and will so continue until replaced through the execution and approval of the resurvey.

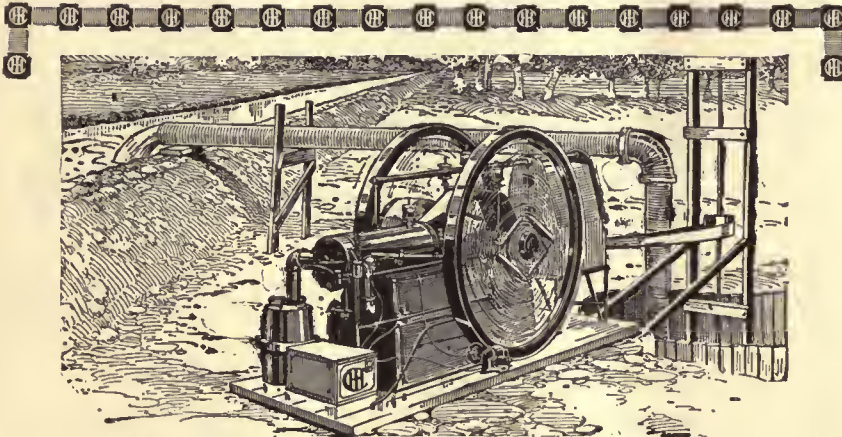


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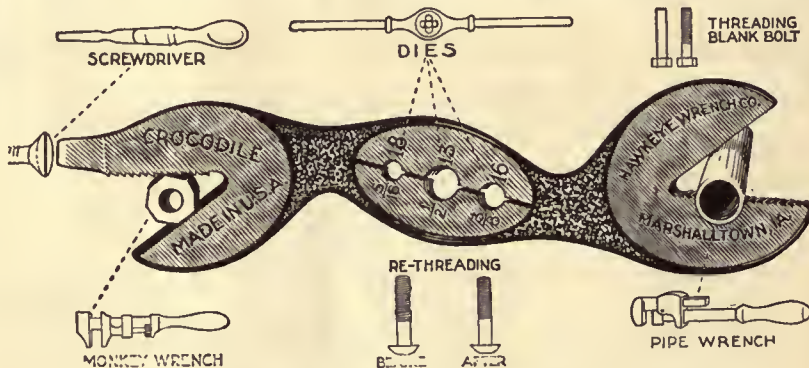
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A pipe wrench, a nut wrench, a screw driver and three dies for cleaning up and re-threading rusted and battered threads; also for cutting new threads on blank bolts. Dies will fit all bolts used on standard farm machinery.

Teeth and dies are case-hardened in bone-black, making them hard and keen.

The dies on this wrench alone would cost \$1.50, and would be worth more than that to every farmer, as they would often save valuable time, besides an extra trip to town for repairs.

Sent free with each order for *Irrigation Age* for one year—price for both \$1.00; also sent to old subscribers who renew their subscription for one year.

Address: IRRIGATION AGE, 30 No. Dearborn St., Chicago

Send \$1.00 for
The Irrigation Age
one year and The
Primer of Irrigation
Paper Bound.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC.,

of *Irrigation Age*, published monthly at Chicago, Ill., required by the Act of August 24, 1912. Name of Editor, D. H. Anderson, Post-Office address, 30 No. Dearborn St., Chicago; Business Manager, E. H. Anderson, 30 N. Dearborn St., Chicago; Publisher, D. H. Anderson; Owner, D. H. Anderson, 30 No. Dearborn St., Chicago. Known bondholders, mortgagees, and other security holders, holding 1 per cent or more of total amount of bonds, mortgages or other securities: None.
D. H. ANDERSON.

Sworn to and subscribed before me this 19th day of September, 1913.

[SEAL]

MICHAEL J. O'MALLEY,
Notary Public.

(My commission expires March 8th, 1916.)

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Irrigating alfalfa with an 8 H. P. Fairbanks-Morse Engine and Centrifugal Pump.

OIL ENGINES CENTRIFUGAL PUMPS

Engines develop full power on Kerosene, Gasoline or Distillate. Their reliability insures supplying your crops with water whenever required. Sizes 2 to 200 H. P.

Pumps to handle from 100 to 400,000 gallons per hour

Thousands of acres throughout the Southwest are being irrigated cheaply with Fairbanks-Morse Equipment. Write for Catalog No. 650C9. State size of farm and crops you will raise.

Fairbanks, Morse & Co.
 900 S. Wabash Ave., Chicago, Ill.

GALVANIZED METAL IRRIGATION FLUME

(Newcomb Patent)

Made entirely of rust-proof, galvanized iron. No bolts or rivets used in construction. This flume is considered by experts to be the most serviceable equipment for the purpose on the market. A careful examination of the construction as shown herewith will convince those who are acquainted with irrigation conditions of its lasting quality and the ease with which it may be put together. Complete information, with prices, will be furnished on application to the

KLAUER MFG. COMPANY, Dubuque, Iowa



Section of Flume



The Farm Burden Bearer

YOU and your farm wagon spend a great deal of time together. Of all farm tools it is your standby. Its wheels bear the burden of big loads—towering racks of hay and grain, sacks of produce, loads of sand and gravel, anything that needs moving, over miles of roads to market. It takes solid strength to stand up long under that. When next you ride on a load, listen to the constant racking, creaking, groaning sound of the wagon box, wheels and running gear as the load pitches back and forth over the road ruts. Not an unpleasant sound, but the

strain that causes it is hard on the wagon. I H C wagons—

**Weber
Columbus**

**New Bettendorf
Steel King**

give the buyer the most he can get for his money because they defy hard usage for the longest time, and are easiest on the horses.

This makes I H C wagon reputation: Selection of the finest grades of lumber, oak, hickory and pine, and of the best quality steel and iron; many months of toughening air-drying for every piece of wood; skilled assembling of parts, fitting of bolts and rivets, and perfect shaping and ironing; application of the purest paint to act as wood preservative and to prevent shrinking and warping of the wood. When the wagon is ready for the farmer, it is practically perfect in every detail and thoroughly up to the I H C standard.

And there are many other reasons we have not room for here why I H C Wagons are the best to buy. Weber and Columbus wagons have wood gears; New Bettendorf and Steel King have steel gears. A visit and a talk at your local dealer's, where the wagons may be seen and studied, will soon convince you as to the wagon you want. Get catalogues from the dealer, or, write the nearest branch house.



WESTERN BRANCH HOUSES: Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.
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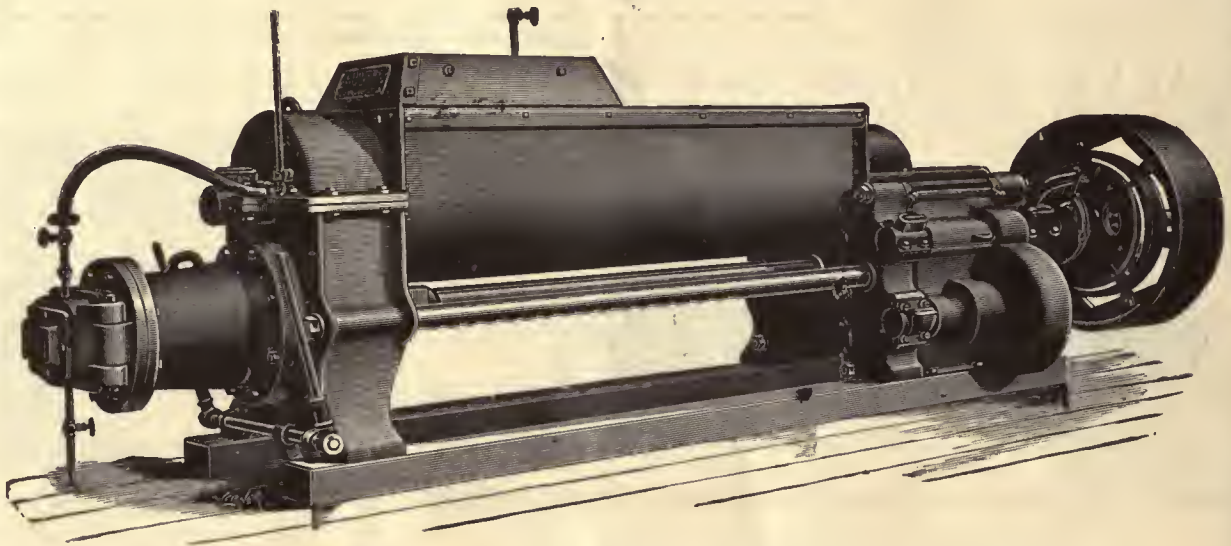
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Outfits for Drain Tile, Hollow Ware, Building
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THE IRRIGATION AGE

VOL. XXVIII

TITLE REGISTERED U.S. PATENT OFFICE

NO. 2

CHICAGO, DECEMBER, 1912

10% of the Cost of Lining Irrigation Ditches



Austin Drainage Excavator

According to Government Reports, is cost for trimming and shaping the ditch bottom and sides.

Eliminate This Cost

by using Austin ditching machines which excavate ditches with cross-sections cut exactly to templet. These ditches are carved cleanly without disturbing the natural soil beyond the channel limits, so that no trimming or shaping is necessary, and very little cleaning is required to fit the earth cut for its concrete or other lining. In addition, Austin Ditching Machines will dig ditches at a lower cubic yard cost than they can be dug by any other means.

Full Details in Catalog "S" and Special Circular No. 200

F. C. Austin Drainage Excavator Company

Agents Wanted in Open Territory.

RAILWAY EXCHANGE, CHICAGO, ILL.



Morris Machine Works

BALDWINSVILLE, N. Y.

Centrifugal Pumping Machinery, designed for any irrigating or dredging proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

New York Office, 39-41 Cortlandt Street
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Myers Power Pumps

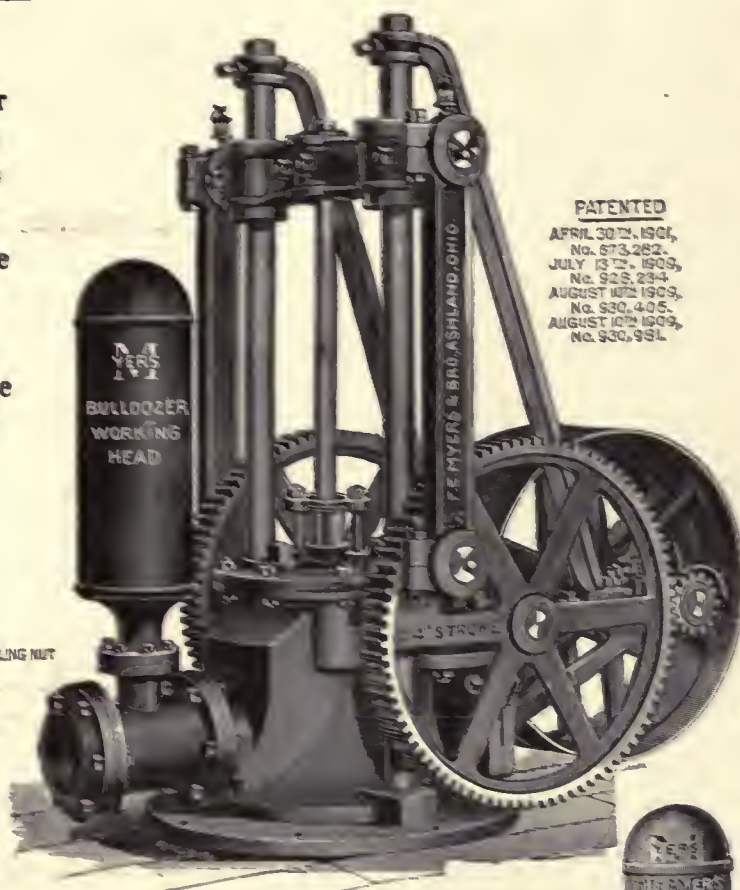
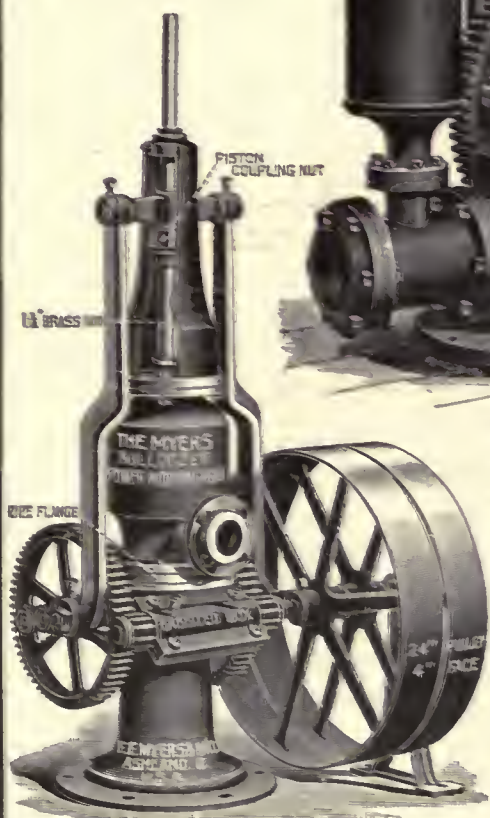
Working Heads, Pumping Jacks, Cylinders, Etc.

PATENTED

The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches



PATENTED

APRIL 30TH, 1901,
No. 673,282,
JULY 13TH, 1909,
No. 922,294,
AUGUST 10TH, 1909,
No. 930,405,
AUGUST 10TH, 1909,
No. 930,981.

PATENTED

The Myers
Bulldozer
Power Pumps
For
Shallow Wells

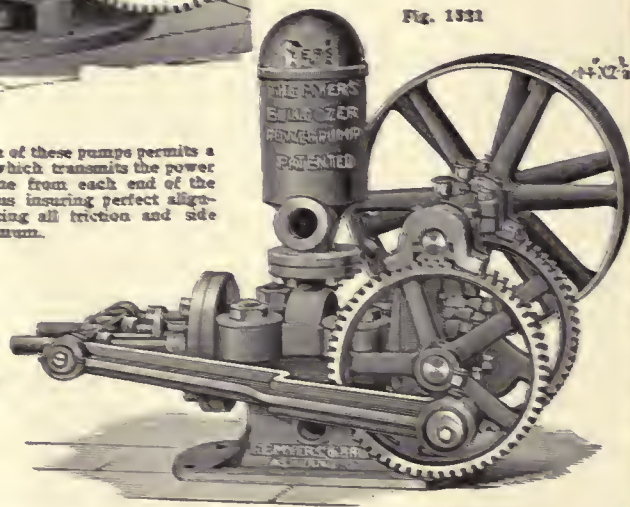
Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2½ to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

Fig. 1931



The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

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for
Catalogue
and
Prices

F. E. MYERS & BRO., ASHLAND, OHIO
ASHLAND PUMP AND HAY TOOL WORKS



A Larger Quantity of Water From A Deep Drill-Hole

than is produced by any other kind of pump except the Air-Lift and the Air-Lift will require a much larger quantity of power for the same amount of water is delivered by the

“American” Turbine Centrifugal

IT adapts the centrifugal principle of pumping to conditions where no other type of centrifugal can be successfully used.

Sand or silt which rapidly destroy the valves in any of the plunger types of pumps do not materially affect the capacity or efficiency of this pump.

Since there are no valves to wear out this pump maintains practically its original efficiency.

The submerged bearings are kept perfectly lubricated by an improved oiling device which conveys oil from the surface and there is practically nothing to get out of order as there are no moving parts in the well except the impellers keyed to the main shaft.

“American” Turbine Centrifugals are made in sizes to operate in wells 12 to 30 inches in diameter, inside of casing, produce best results on heads to 200 feet and deliver from 700 to 3,000 gallons of water per minute.

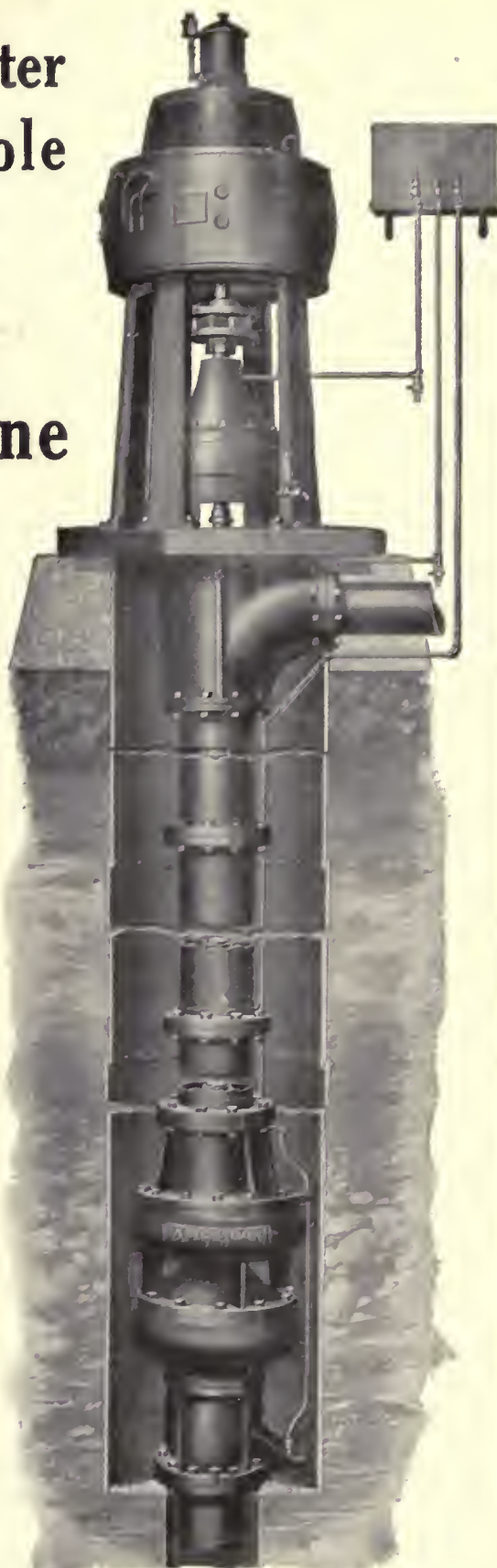
These pumps develop up to 70 per cent efficiencies and are especially adapted for pumping large, deep wells in water-works, manufacturing plants and for irrigation purposes.

“American” Turbine Centrifugals are described in Catalog No. 117, the most complete centrifugal pump catalog published. Write for a copy today.

The American Well Works

General Office and Works: Aurora, Ill.

Chicago Office: First Nat'l Bank Bldg.



Davenport Roller Bearing Steel Mountain Wagon



Built Like a Bridge

Like the modern steel railway bridge, the Davenport Wagon is built for the heaviest lifetime service. Structural steel I-beams, channels, and angles securely held together by large steel rivets put in hot, make up the front and rear gears.

Davenport running gear cannot become loose and rattle. It is not affected by changes in the weather. It does not dry apart or rot. Each gear remains practically one piece.

Strongest Wagon Wheels Made

Steel wheels on the Davenport Wagon are made with a tension. Each spoke carries its share of the load all the time and not only when it is the underspoke. Davenport Wagon wheels are stronger

**No Bolts or Nuts
to come loose
No Tires to Reset
No Cracked Hubs
No Split Felloes
No Broken Axles
No Repair Bills**

**Light Draft
Strong and
Durable**

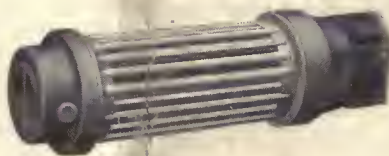
and will last longer than any other wagon wheels made.

The tires run flat on the ground and straight ahead—not on their edge as is the case with the ordinary wagon.

Roller Bearings—Light Draft

That roller bearings reduce draft is generally known. Straight roller bearings on the Davenport makes it the lightest draft wagon on the market.

Even after years of use these roller bearings show no appreciable wear. They are practically everlasting.



THE ROLLER BEARING

It is not necessary to take the wheels off to oil a Davenport. Just push back the cover of the oil cup and squirt in a few drops of oil; the cover closes automatically.

Davenport Roller Bearing Steel Wagon is just the wagon for the irrigation districts. Get our booklet entitled "When the Going Is Hard." Tells all about wagon construction. You will get it free with a complete description of the Davenport Wagons if you ask for package No. B-55.

John Deere Plow Company, Moline, Ill.

THE IRRIGATION AGE

VOL. XXVIII

TITLE REGISTERED U.S. PATENT OFFICE

No 3

CHICAGO, JANUARY, 1913

This Austin Ditch is Exactly as the Machine Left It

An Austin Ditch Machine does not merely "rough-out" a ditch, it produces a clean ditch—a drainage ditch into which water can be turned immediately or an irrigation ditch which can be lined without trimming or cleaning.



Austin Combination Sloping or Vertical Bank Excavator

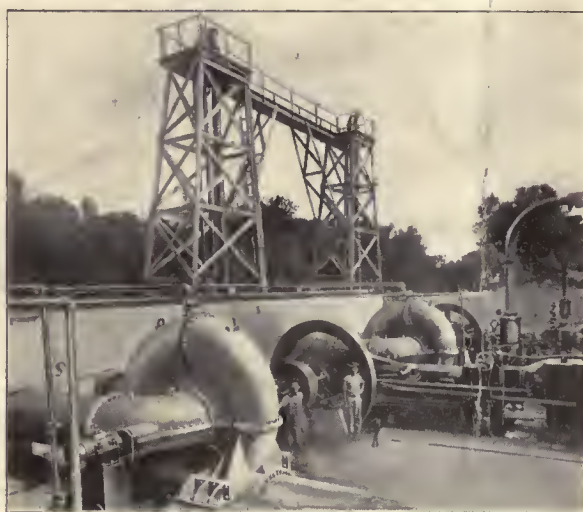
An Austin Ditch Machine produces a ditch section which is a true trapezoid—a straight edge laid up and down the slope touches at every point. Other wheel excavators cut a concave slope on which a straight edge touches only at top and bottom.

Send for Catalogue "S" and Circular No. 200

F. C. Austin Drainage Excavator Company

Agents Wanted in Open Territory

RAILWAY EXCHANGE, CHICAGO, ILL.



Morris Machine Works

BALDWINVILLE, N. Y.

Centrifugal Pumping Machinery, designed for any irrigating or dredging proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

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Myers Power Pumps

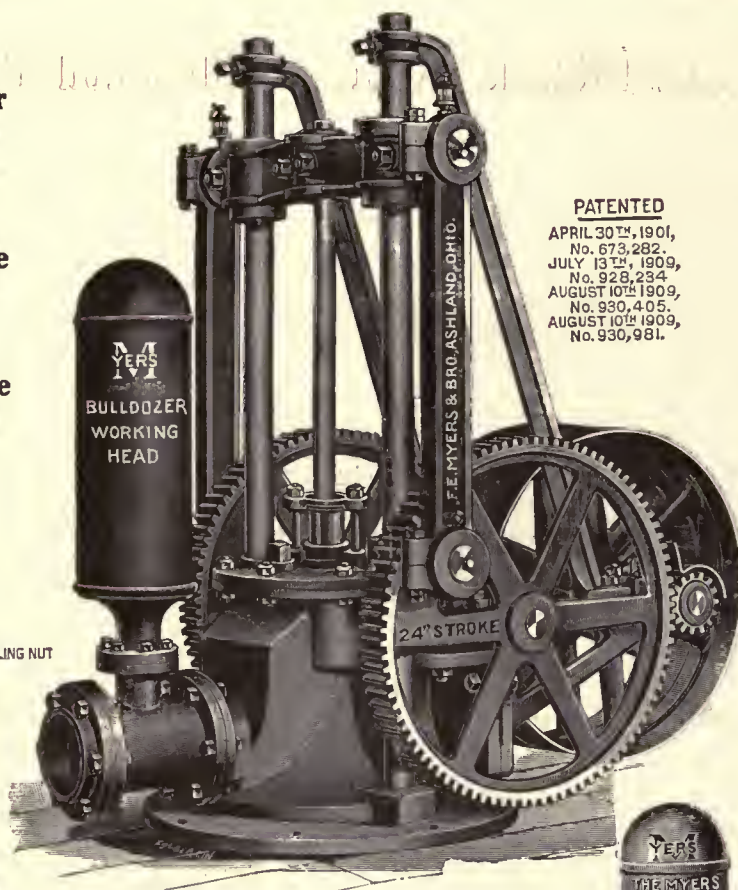
Working Heads, Pumping Jacks, Cylinders, Etc.

PATENTED

The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches



PATENTED
APRIL 30TH, 1901,
No. 673,282.
JULY 13TH, 1909,
No. 928,234
AUGUST 10TH 1909,
No. 930,405.
AUGUST 10TH 1909,
No. 930,981.

PATENTED

The Myers
Bulldozer
Power Pumps
For
Shallow Wells

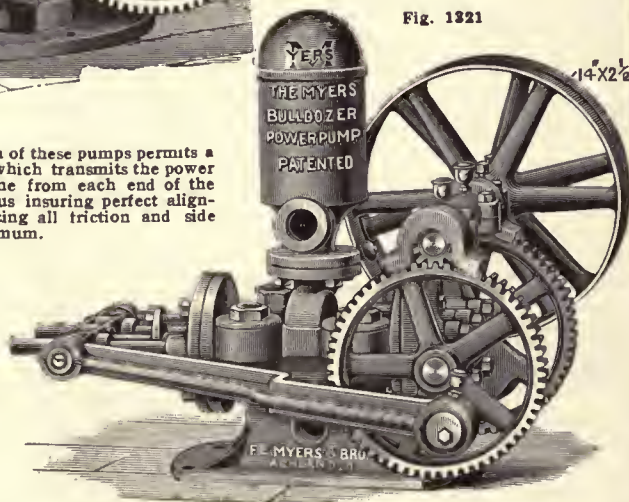
Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2½ to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

Fig. 1321



The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

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for
Catalogue
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Prices

F. E. MYERS & BRO., ASHLAND, OHIO
ASHLAND PUMP AND HAY TOOL WORKS



Interior View of One of the Pump Houses Showing American Turbine Centrifugal Pump.

some by American Deep Well Turbine Centrifugals. Four wells deliver 500 gallons per minute and one 400 gallons per minute. Average pumping depth is 73 feet and 500 gallon pumps are operated by 20 horse power motors.

But the important point is the main shafts and impellers are supported by roller thrust bearings at the surface, all oiling is done at the surface, there is nothing in the well that can get out of order and a permanent water supply is provided of greatest reliability, with least attendance, smallest expense for upkeep and the assurance that the water is pure.

"American" Centrifugals are made in types to meet nearly every pumping condition. Complete catalogs for the asking.

Difficult Water Supply Conditions Are Met with American Centrifugals

The highest development of the centrifugal principle of pumping and the application of this improved design to all styles of centrifugals enables the "American" centrifugal to successfully meet the most difficult water supply conditions,

At Tulsa, Oklahoma, the city water is obtained from wells which will not deliver a large quantity of water. The situation is successfully met by "American" centrifugals as shown in the accompanying views.

There are five wells located a considerable distance apart, two of which and the substation are illustrated. Some of the wells are pumped by American vertical centrifugals and



One of the wells illustrating the Housing and Discharge of Pump Before Pipe Connection Was Made.

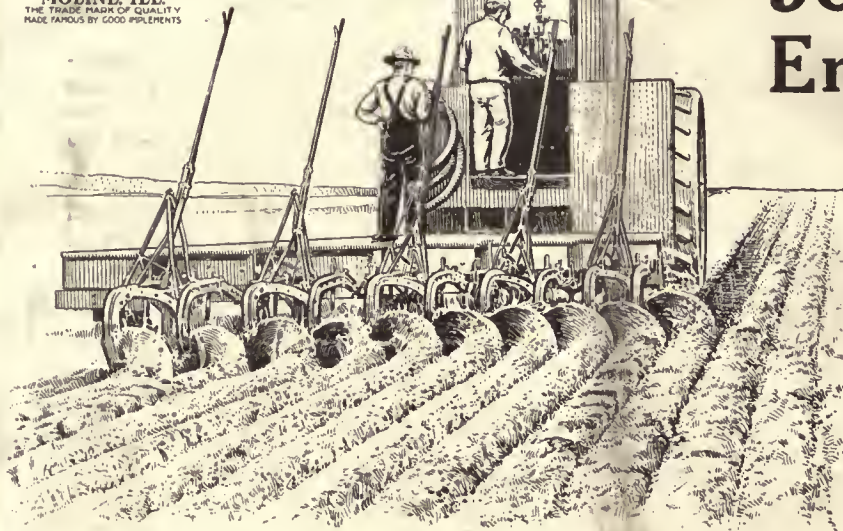


Substation and Two of the Five Wells that Furnish the Water Supply for Tulsa, Okla.

The American Well Works

General Office and Works: Aurora, Ill.
Chicago Office: First Nat'l Bank Bldg.

JOHN DEERE
REGISTERED U.S. PAT. OFFICE
MOLINE, ILL.
THE TRADE MARK OF QUALITY
MADE FAMOUS BY GOOD IMPLEMENTS



John Deere Engine Plow

With Quick Detachable
Shares
Either Moldboard or
Breaker Bottoms
Hitch Control

John Deere Little Engine Plow
4 to 6 Bottoms
John Deere Junior Engine Plow
6 to 8 Bottoms
John Deere Senior Engine Plow
8 to 10 bottoms
John Deere Big Engine Plow
10 to 14 Bottoms

Quick Detachable Shares. Great Invention. Something New. Saves 80 per cent of time. One man can change all shares in a few minutes. Insist on this valuable feature. Find out all about it. Write for best book on engine plowing ever printed—Free.

One man can change all the shares on a John Deere Gang in a few minutes. On other engine plows two men will spoil a half-day. No expensive outfit standing idle for hours, while shares are being changed.

Loosen One Bolt to Remove Shares

You remove the nut from only one bolt to change the share. No tools needed but a wrench. Nut is in plain sight and easy to get at—no trouble to loosen.

Think of the time, labor and expense saved by using the JOHN DEERE QUICK DETACHABLE SHARES. It means money in your pocket every time shares are sharpened or new ones put on.

There are too many shares to take care of on

an engine plow to use the old style bolted shares. JOHN DEERE QUICK DETACHABLE SHARES save 80 per cent of the time and are stronger and more durable than old style engine plow shares.

Strongest Plow Built

The new special beams on a John Deere Engine Plow are 30 per cent stronger, by actual test, than any other beam ever made. There are more of these plows in actual use than all other makes combined. They are at work in every state and every country. They are tried and true—no experiment. No other engine plow has the new Quick Detachable Shares. Buy the best—take no chances.

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Ask us for any of the following special agricultural books by prominent authors and we will send it to you free.

Bigger Crops From Better Seed Beds—
What proper seed bed preparation means; Single and Double Action Disc Harrows.

Farm Manures and Fertilizers—
The value of various kinds of manures and commercial fertilizers.

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Modern Methods of Deep Tillage—
When to plow deep, and why.

Science and Art of Plowing—
When and how to plow under all conditions with all kinds of plows.

John Deere Disc Plow

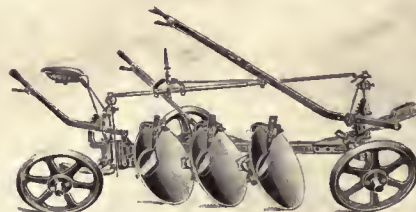
The John Deere Disc Plow is thoroughly adapted to use in very hard, sticky, waxy or gumbo soils, where moldboard plows cannot be used. It may also be used in old ground or stubble in which it is desirable to plow five inches or more in depth.

The rear wheel turns both to the right and left and locks automatically. On the "haw" turn this wheel casters or turns automatically. On the "gee" turn the foot trip is used to release the stop catch.

This feature makes it easy to turn square corners in either direction.

A full depth furrow is opened the first time around. Most disc plows require from two to three rounds to get down to normal working depth.

The John Deere Disc Plows are convertible from single to double, triple or quadruple, or vice versa.



To Get the Information You Want Tell us which style of plow you are interested in and also which of the agricultural books mentioned in this advertisement you wish us to send you. You will get this free, postpaid, if you mention the Irrigation Age.

John Deere Plow Co., Moline, Ill.

THE IRRIGATION AGE

CHICAGO, ILLINOIS

With Which Is Merged

**National
Land and Irrigation
Journal**

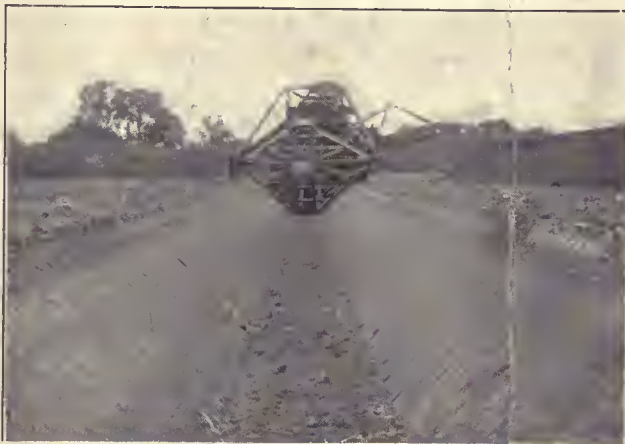
FEBRUARY, 1913

Vol. XVIII

TITLE REGISTERED U.S. PATENT OFFICE

No. 4

Irrigation Laterals that can be Lined Without Trimming



Ten per cent of the cost of concrete-lining irrigation laterals (according to Government Reports) is consumed in trimming and shaping the ditch to receive the concrete.

This 10 per cent is saved by digging irrigation laterals with an Austin Ditch Machine, which carves a true trapezoidal channel from the natural soil.

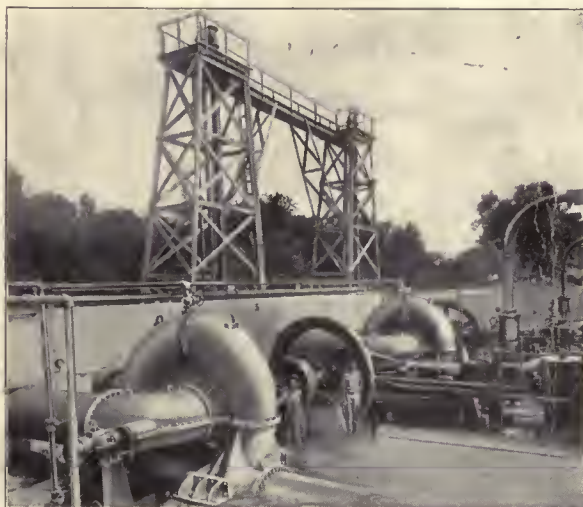
Austin Ditching Machines are made for digging irrigation main canals up to 75 ft. bottom width, or for enlarging old ditches; these machines all produce in one operation a complete canal with sloped sides and wide berms.

Send for Catalogue "S" and Circular No. 200

F. C. Austin Drainage Excavator Company

Agents Wanted in Open Territory.

Railway Exchange, Chicago, Ill.



Morris Machine Works

BALDWINVILLE, N. Y.

Centrifugal Pumping Machinery, designed for any irrigating or dredging proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

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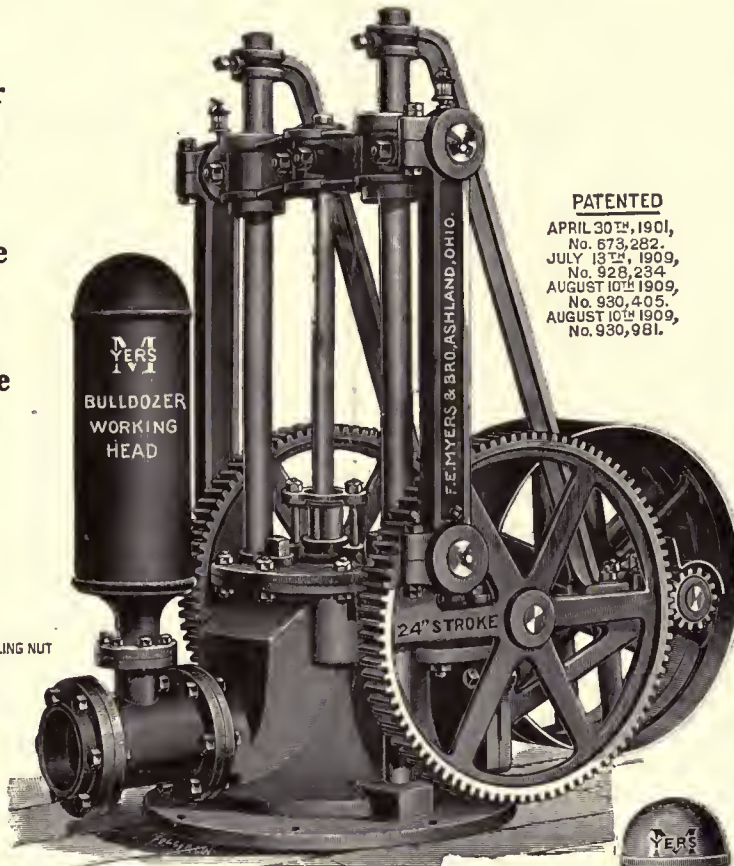
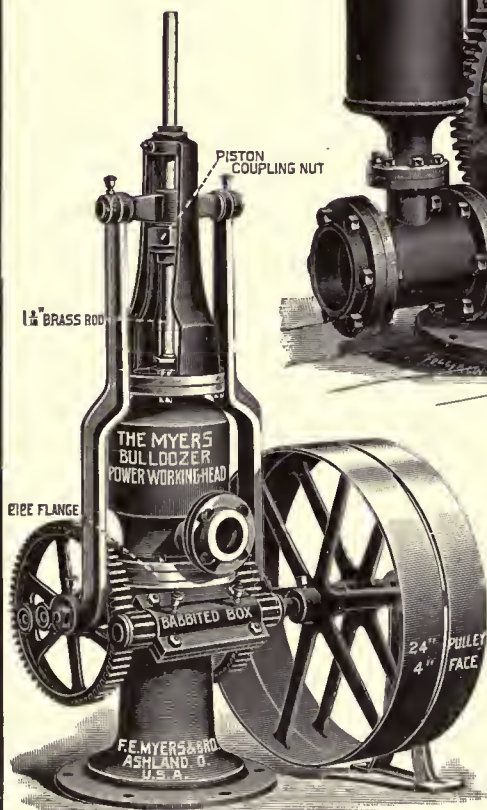
Working Heads, Pumping Jacks, Cylinders, Etc.

PATENTED

The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches



PATENTED
APRIL 30TH, 1901,
No. 673,282.
JULY 13TH, 1909,
No. 928,234
AUGUST 10TH 1909,
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For
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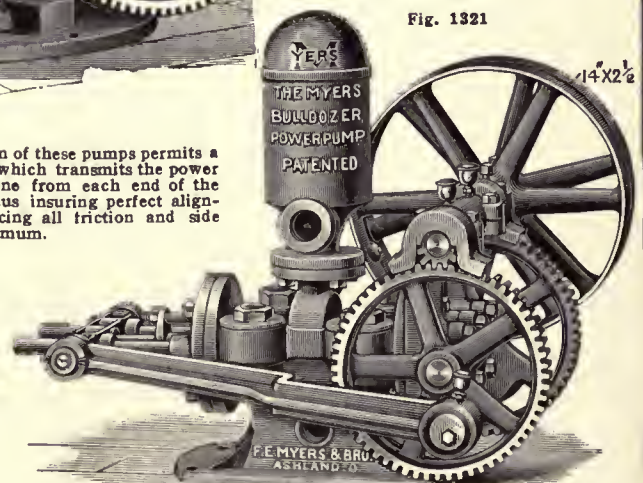
Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2½ to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

Fig. 1321

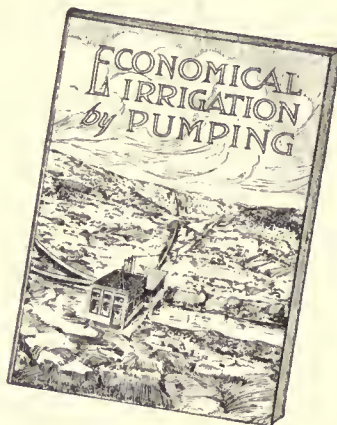


The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

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F. E. MYERS & BRO., ASHLAND, OHIO

ASHLAND PUMP AND HAY TOOL WORKS



This Free Booklet

Contains More Practical Information On Irrigation Pumping Than Any Other Published

It is not a catalog but a booklet on the most economical types of pumping installations to meet different irrigation pumping conditions.

The American Well Works install more pumps for irrigation purposes than any other American manufacturer. Recognizing that the best type of pump for the location is rarely installed this booklet was prepared to illustrate and describe different pumping conditions and the types of pumps adapted to handle them most successfully. "American" pumps are illustrated only to show types of installations.

Besides pumping installation, the leading methods of applying water in irrigation are illustrated and briefly described. The booklet also contains several pages of valuable irrigation pumping tables.

This booklet is $7\frac{1}{2} \times 10\frac{1}{2}$ inches in size, contains 72 pages and cover, is illustrated by 76 half tone engravings and line drawings and contains more practical information on irrigation pumping than any other book published. A copy will be sent to you free provided you mention this paper and Bulletin 127.

If interested in "American" pumping machinery ask for Catalog 110 describing deep well plunger pumps; Catalog 117 describing centrifugal pumps; Catalog 124 describing deep well centrifugals.

The American Well Works

General Office and Works: Aurora, Ill.
Chicago Office: First Nat'l Bank Bldg.

John Deere Model "B" Disc Harrow

CORRECT CULTIVATION COUNTS

It means healthy and rapid growth of seed. Seed, in order to develop, requires nourishment just the same as does anything else. Give it a seed bed where it can get this nourishment easily and quickly. Use a disc harrow both before and after plowing. You will then get maximum returns.



Field Scene Model "B" Disc Harrow

Model "B" Construction

The Model "B" Disc Harrow frames are built of double steel bars instead of single, are stiff and strong with extra clearance. They are securely riveted together, and in fact every part of the machine that has to stand any strain is so well braced that there are no weak parts.

THE MODEL "B"

is the harrow that makes the seed bed just right for the rapid development of the grain. It makes a better seed bed than any other harrow because it has the improvements which enable it to do so. The Model "B" is the only spring pressure, and therefore the only flexible harrow built. This gives you greater penetrating power and more thorough cultivation at an even depth than is secured by any other such implement.

THE FLEXIBLE HARROW

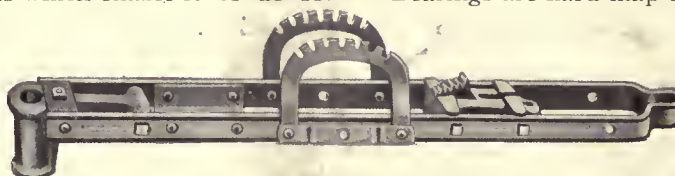
It is the only harrow that thoroughly cultivates the ground. This thorough work is made possible by the patented spring pressure which compels the discs to cut at an even depth. Its two gangs are independently adjustable. In the field, only that part of the Model "B" passing over an obstruction is raised out of the ground, while the balance continues to do its work. With a rigid harrow the entire implement is lifted out, leaving considerable ground uncultivated.

When working on hillsides a harrow naturally has a tendency to crowd towards the bottom. This is overcome by the Model "B" as you are able to give the lower gang a greater relative angle.

Discs, Bearings and Scrapers

Deere Disc blades are made of the highest quality of steel, thoroughly polished on the cutting side, and ground to a sharp cutting edge.

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Mailed free if you mention the Irrigation Age.

JOHN DEERE PLOW COMPANY, Moline, Illinois

THE IRRIGATION AGE

CHICAGO, ILLINOIS

With Which Is Merged
**National
Land and Irrigation
Journal**

MARCH, 1913

Vol. XVIII

TITLE REGISTERED U.S. PATENT OFFICE

No. 5

The Banks of a Drainage Ditch



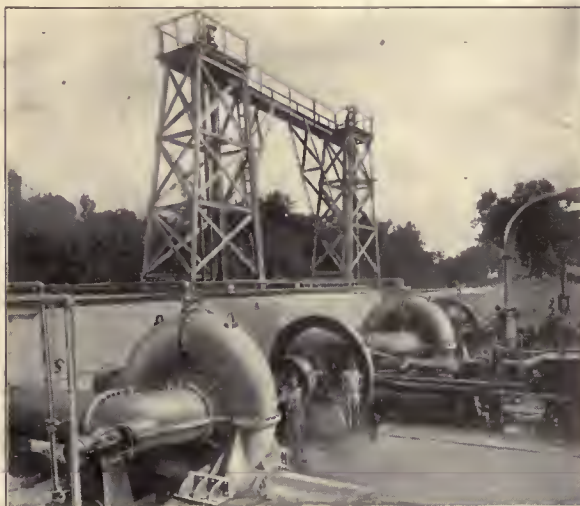
are important elements in both its life and its working efficiency. An engineer always designs a ditch with banks sloped to the angle of repose of the soil, and he computes its capacity on the assumption of smooth, even sides cut to exact slope.

An Austin Drainage Excavator Reproduces in Earth the Plans of the Engineer.

And has a capacity of 800 to 1,000 Cubic Yards of Excavation per Day.

Catalog "S"

F. C. AUSTIN DRAINAGE EXCAVATOR COMPANY Ry. Ex., Chicago, Ill.
Agents Wanted in Open Territory



Morris Machine Works

BALDWINVILLE, N. Y.

Centrifugal Pumping Machinery, designed for any irrigating or dredging proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

New York Office, 39-41 Cortlandt Street
HENION & HUBBELL - - General Agents
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HARRON, RICKARD & McCOMB - - Agents
San Francisco and Los Angeles, California

H. A. PAINE, Agent - - - Houston, Texas

SPECIAL FEATURES

Irrigation and Irrigation
Securities.

Newell Answers James
J. Hill.

Sun Power Plant in
Egypt.

Sweet Clover or
Bokhara.

Myers Power Pumps

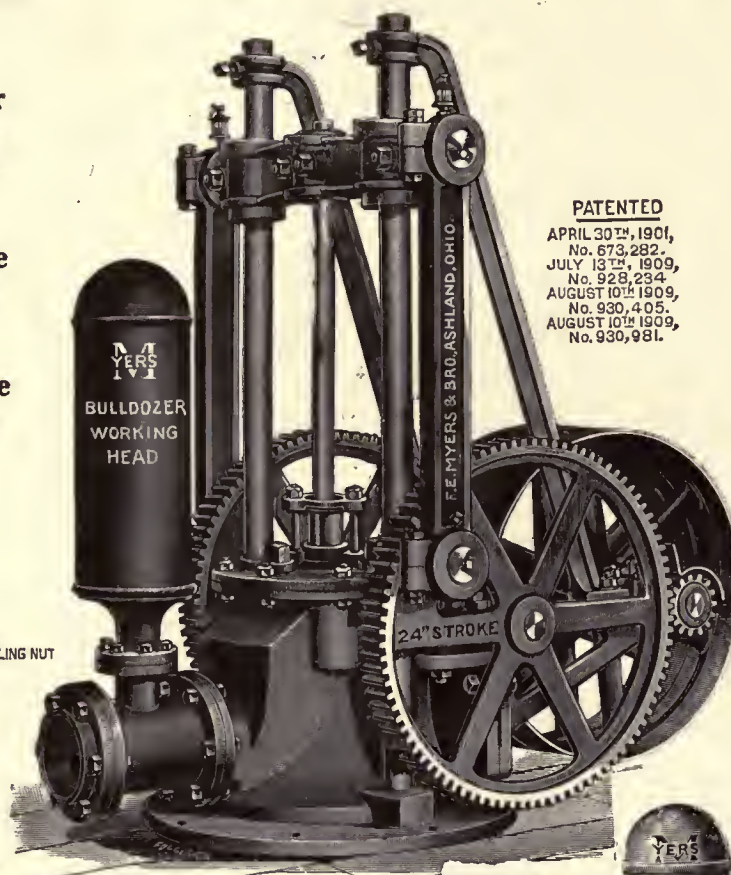
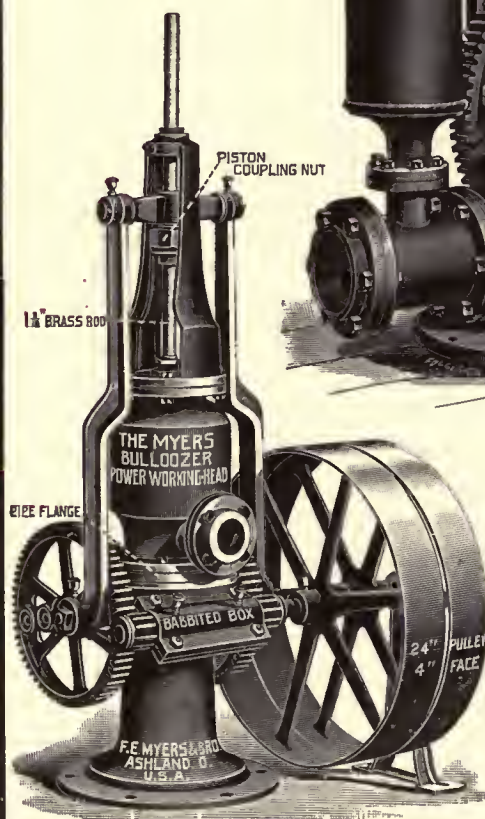
Working Heads, Pumping Jacks, Cylinders, Etc.

PATENTED

The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches



PATENTED
APRIL 30TH, 1901,
No. 673,282.
JULY 13TH, 1909,
No. 928,234.
AUGUST 10TH 1909,
No. 930,405.
AUGUST 10TH 1909,
No. 930,981.

PATENTED

The Myers
Bulldozer
Power Pumps
For
Shallow Wells

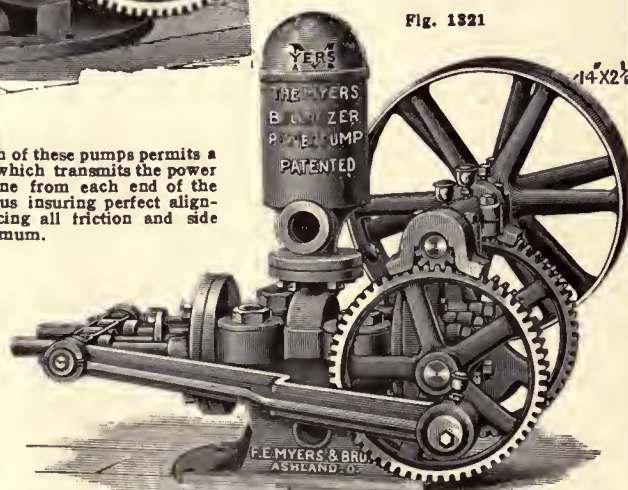
Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2½ to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

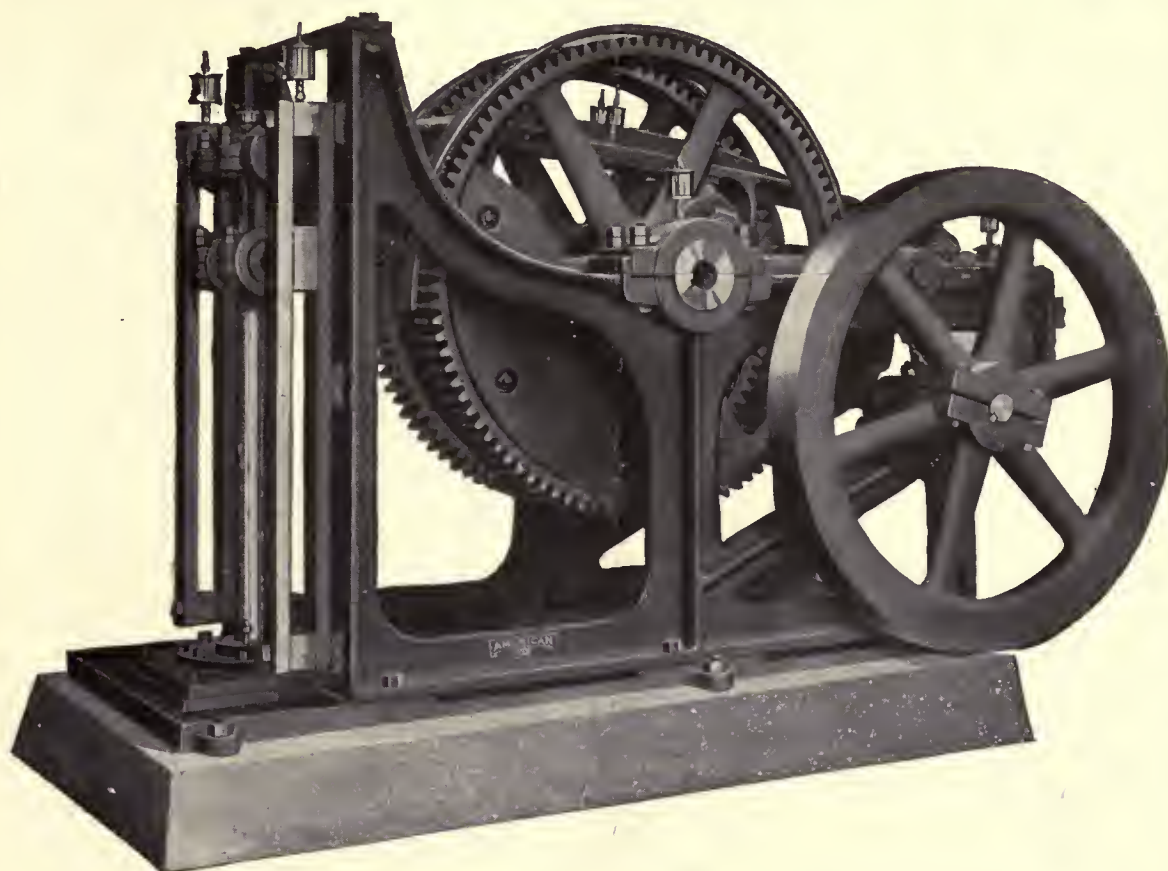
Fig. 1321



The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

Write
for
Catalogue
and
Prices

F. E. MYERS & BRO., ASHLAND, OHIO
ASHLAND PUMP AND HAY TOOL WORKS



This Pump Jack Means Greatest Economy In Large Quantity Pumping From Small Deep Wells

It is adapted for pumping wells of so small a diameter that they can be pumped only by plunger pumps and the air lift. It delivers a larger quantity than any other type of a plunger pump and it is far more economical of power than the air lift.

It permits the use of a double acting water cylinder with a 36 inch stroke.

And it is used in conjunction with the "American" water cylinder — having the cylinder shell, plunger and valves constructed entirely of bronze and so designed that the valves can be drawn from the well with the plunger rods without disturbing the casing.

This pump jack is very rigid in construction and has enormous strength. It occupies

small floor space and every part is accessible without climbing.

The important feature about this jack is the improved, pivoted, roller-bearing walking beam, giving a long stroke to the plunger rod with a short drop travel of the main shaft.

The gear wheels are counterbalanced, the gears are machine cut and the pinions are made of rawhide for noiseless operation.

This jack is operated either by belt power or directly geared to electric motor.

If you have large capacity pumping from deep wells, let us show you why this improved jack will solve your pumping problems most economically. Write for deep well catalog 110.

The American Well Works
General Office and Works: Aurora, Ill.
Chicago Office: First National Bank Building



John Deere Model "B" Disc Harrow

CORRECT CULTIVATION COUNTS

It means healthy and rapid growth of seed. Seed, in order to develop, requires nourishment just the same as does anything else. Give it a seed bed where it can get this nourishment easily and quickly. Use a disc harrow both before and after plowing. You will then get maximum returns.



Field Scene Model "B" Disc Harrow

Model "B" Construction

The Model "B" Disc Harrow frames are built of double steel bars instead of single, are stiff and strong with extra clearance. They are securely riveted together, and in fact every part of the machine that has to stand any strain is so well braced that there are no weak parts.

THE MODEL "B"

is the harrow that makes the seed bed just right for the rapid development of the grain. It makes a better seed bed than any other harrow because it has the improvements which enable it to do so. The Model "B" is the only spring pressure, and therefore the only flexible harrow built. This gives you greater penetrating power and more thorough cultivation at an even depth than is secured by any other such implement.

THE FLEXIBLE HARROW

It is the only harrow that thoroughly cultivates the ground. This thorough work is made possible by the patented spring pressure which compels the discs to cut at an even depth. Its two gangs are independently adjustable. In the field, only that part of the Model "B" passing over an obstruction is raised out of the ground, while the balance continues to do its work. With a rigid harrow the entire implement is lifted out, leaving considerable ground uncultivated.

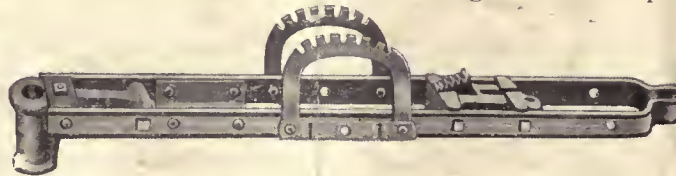
When working on hillsides a harrow naturally has a tendency to crowd towards the bottom. This is overcome by the Model "B" as you are able to give the lower gang a greater relative angle.

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CHICAGO, ILLINOIS

With Which Is Merged

**National
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Journal**

APRIL, 1913

Vol. XVIII

TITLE REGISTERED U.S. PATENT OFFICE

No. 6

In Addition to Digging Perfect Frost-Proof



F. C. Austin Drainage Excavator Co.

Railway Exchange, CHICAGO

AGENTS WANTED IN OPEN TERRITORY

and Erosion-Proof Ditches, with exactly shaped banks and berm, AUSTIN EXCAVATOR TYPE A will build **levees** with efficiency-factors that make consideration of the dipper dredge out of the question.

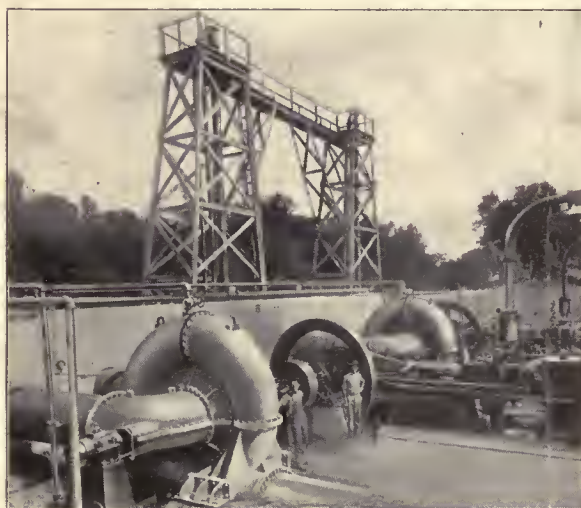
You Need no Water-Filled borrow pit to float in. Austin Buckets take up **all earth**, and the spoil conveyor cuts down teaming costs, because the material is delivered to a **distance**.

You Can Dig Both Ways with Austin Machines. Self-tracking attachments, all steel construction, self-cleaning buckets complete the bill.

—Please cut this out—

REMINDER

To write to F. C. Austin Drainage Excavator Co., Railway Exchange, Chicago, Ill., for Catalogue "S"



Morris Machine Works

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Centrifugal Pumping Machinery, designed for any irrigating or dredging proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

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SPECIAL FEATURES

Lessons from Deep Till- ing Experiments.	Important Decisions by Secretary Lane.	Seed Growing in South- ern Idaho.	Country Roads of Con- crete
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Myers Power Pumps

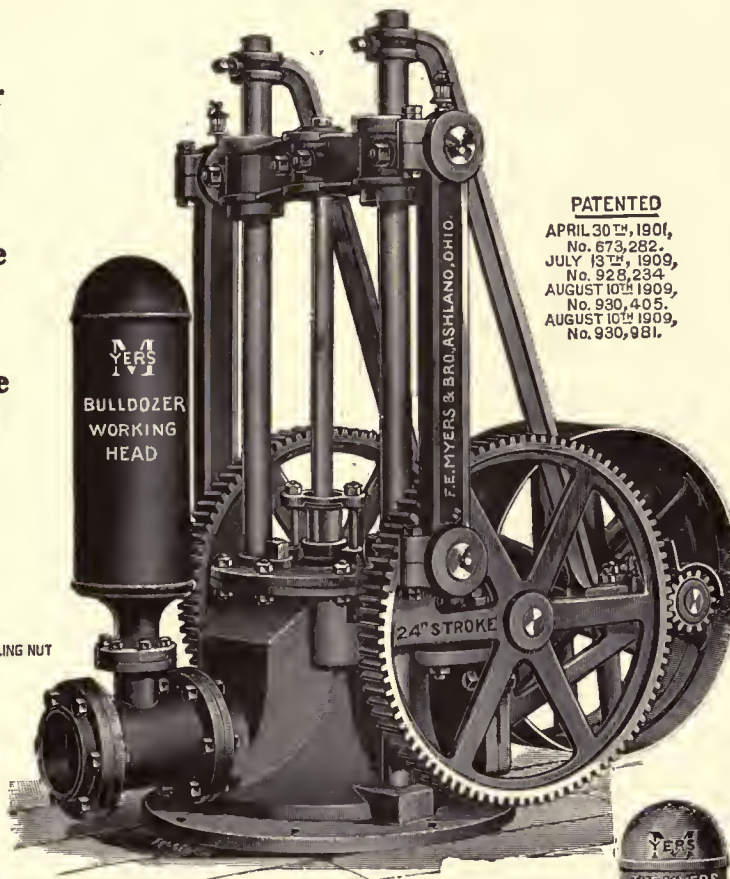
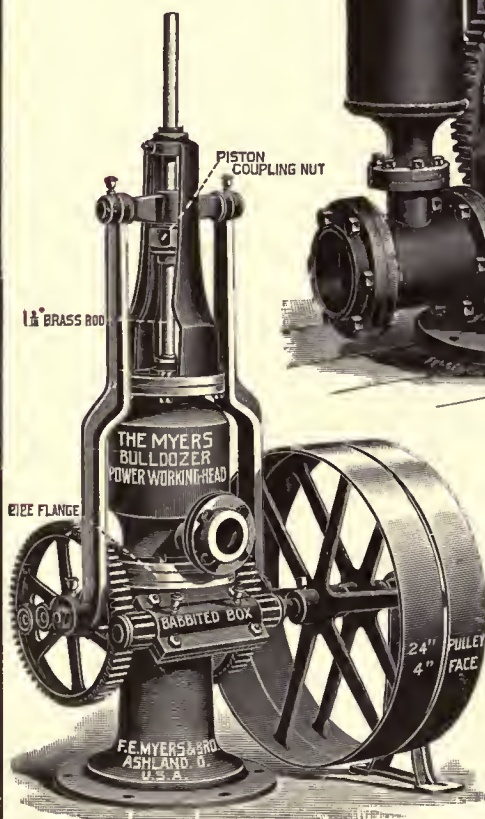
Working Heads, Pumping Jacks, Cylinders, Etc.

PATENTED

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For Deep Wells

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5 to 24 inches

Size of Discharge
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No. 925,234.
AUGUST 10TH 1909,
No. 930,405.
AUGUST 10TH 1909,
No. 930,981.

PATENTED

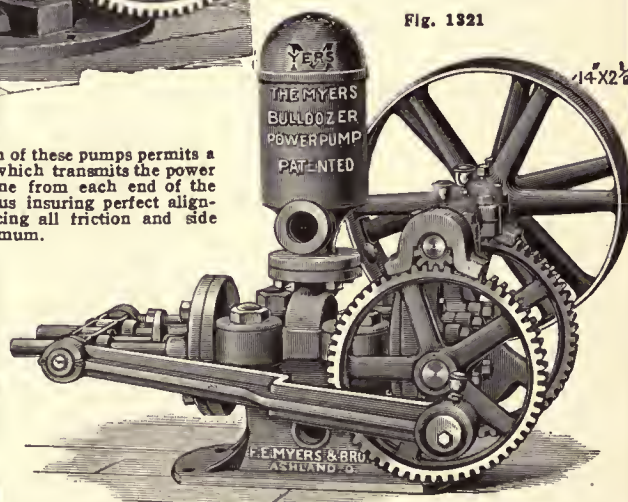
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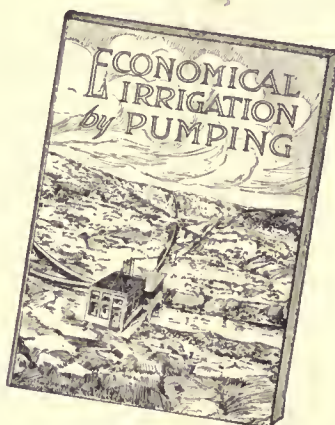
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Catalogue
and
Prices

F. E. MYERS & BRO., ASHLAND, OHIO
ASHLAND PUMP AND HAY TOOL WORKS



This Free Booklet

Contains More Practical Information On Irrigation Pumping Than Any Other Published

It is not a catalog but a booklet on the most economical types of pumping installations to meet different irrigation pumping conditions.

The American Well Works install more pumps for irrigation purposes than any other American manufacturer. Recognizing that the best type of pump for the location is rarely installed this booklet was prepared to illustrate and describe different pumping conditions and the types of pumps adapted to handle them most successfully. "American" pumps are illustrated only to show types of installations.

Besides pumping installation, the leading methods of applying water in irrigation are illustrated and briefly described. The booklet also contains several pages of valuable irrigation pumping tables.

This booklet is $7\frac{1}{2} \times 10\frac{1}{2}$ inches in size, contains 72 pages and cover, is illustrated by 76 half tone engravings and line drawings and contains more practical information on irrigation pumping than any other book published. A copy will be sent to you free provided you mention this paper and Bulletin 127.

If interested in "American" pumping machinery ask for Catalog 110 describing deep well plunger pumps; Catalog 117 describing centrifugal pumps; Catalog 124 describing deep well centrifugals.

The American Well Works

General Office and Works: Aurora, Ill.
Chicago Office: First Nat'l Bank Bldg.

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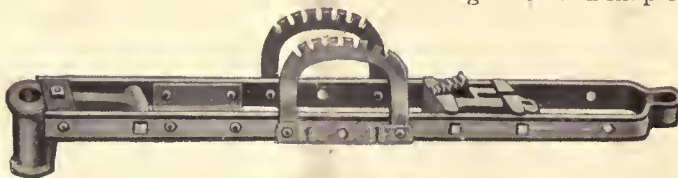
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Hard-oil Compression Grease Cups on all Bearings placed where they are easy to get at

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Mailed free if you mention the Irrigation Age.

JOHN DEERE PLOW COMPANY, Moline, Illinois

THE IRRIGATION AGE

CHICAGO, ILLINOIS

With Which Is Merged
**National
Land and Irrigation
Journal**

MAY, 1913

Vol. XVIII

TITLE REGISTERED U.S. PATENT OFFICE

No. 7

Maintaining Ditches is a Big Problem of Irrigation and Land Reclamation

Take a ditch dug by the Austin Drainage Excavator. Hard, smooth, firm slopes of absolute uniformity. A good berm with properly placed banks.



No chance of caving banks or accumulations of debris.

Or take a dipper dredge product. Banks gouged out to irregular line and left in prime condition to cave; bottom irregular, so capacity is reduced and accumulation of silt and debris made certain.

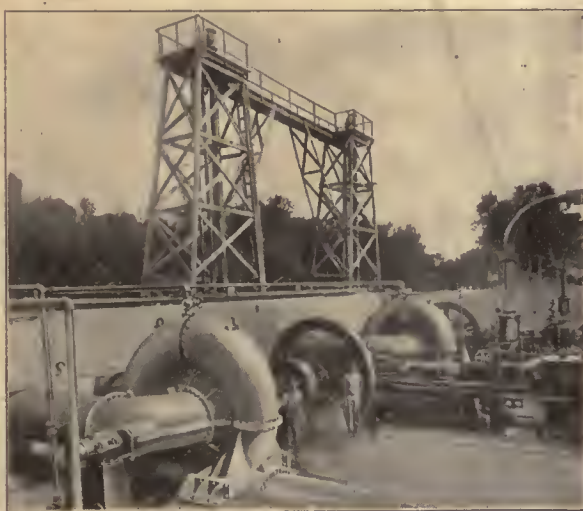
Your interests make it worth while to know the proper method of constructing ditches.

Catalog "S" will give you many reliable ideas of what others have done in this direction.

F. C. Austin Drainage Excavator Company

Agents wanted in open territory

Railway Exchange Chicago, Ill.



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San Francisco and Los Angeles, California
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SPECIAL FEATURES

Endangers Carey Act
Projects.

Lane Misunderstands
Present Laws.

Investigating Salt River
Project.

Uncle Sam Predicts Flow
of Irrigation Streams.

Myers Power Pumps

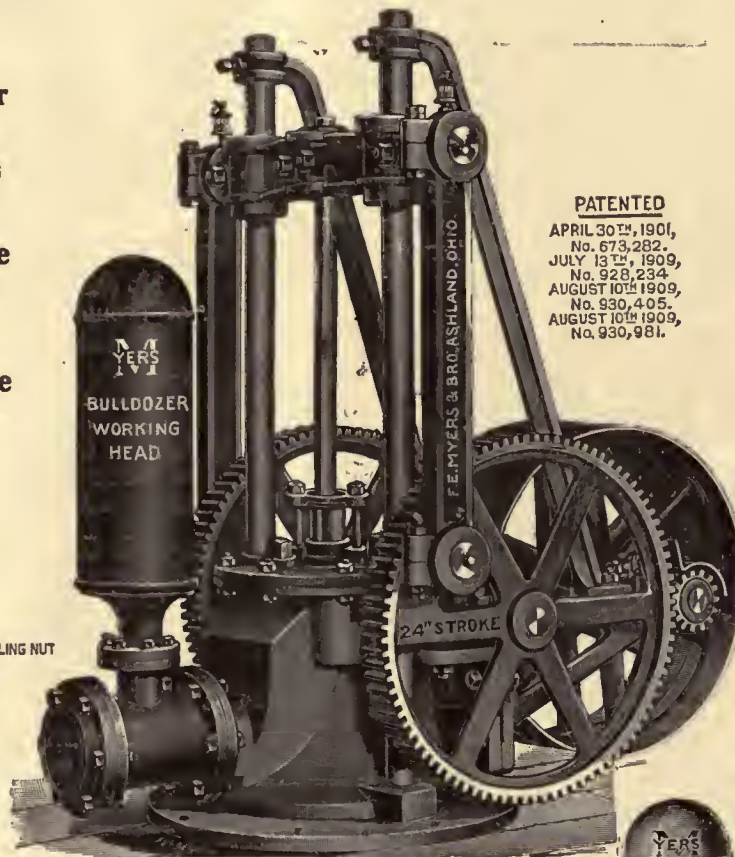
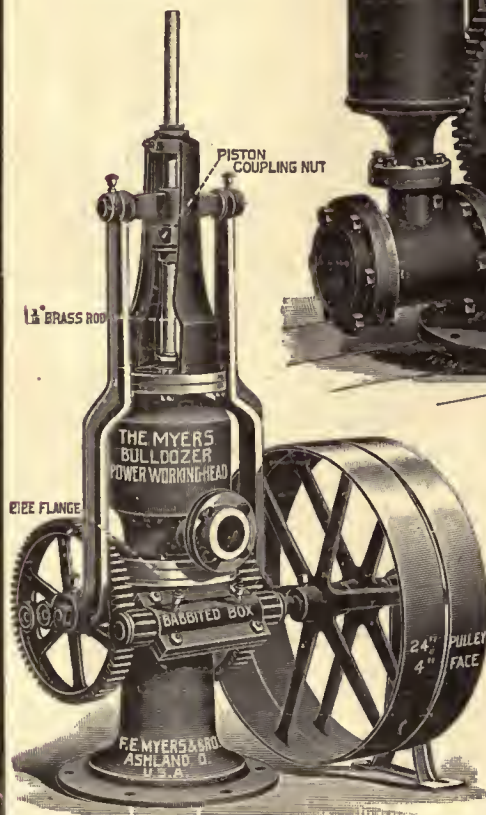
Working Heads, Pumping Jacks, Cylinders, Etc.

PATENTED

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Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches



PATENTED

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No. 673,282.
JULY 13TH, 1909,
No. 928,234
AUGUST 10TH 1909,
No. 930,405.
AUGUST 10TH 1909,
No. 930,981.

PATENTED

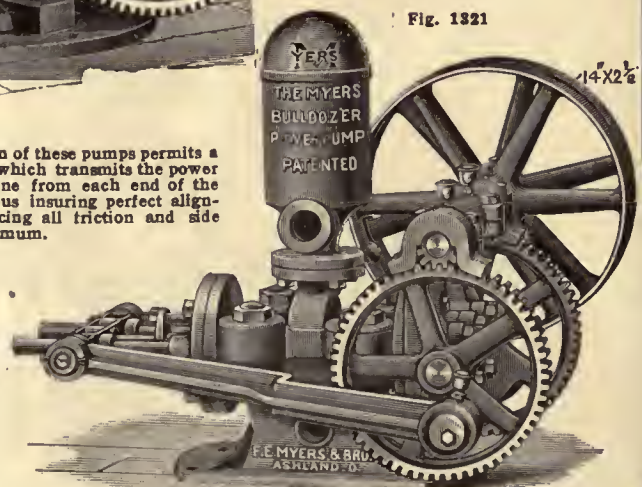
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Bulldozer
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Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2½ to 6 inches

Size of
Discharge
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Capacities
600 to 7200 Gallons
per Hour



The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

Write
for
Catalogue
and
Prices

F. E. MYERS & BRO., ASHLAND, OHIO
ASHLAND PUMP AND HAY TOOL WORKS

When People Think Best Centrifugal Pumps They Think "American"

CALIFORNIA is the home of irrigation in the United States. It was first extensively practised there and it is there that it is in largest use at the present time.

Early in 1910 the Patterson Ranch Company purchased a tract of 14,000 acres in one of the most fertile spots along the San Joaquin River with the express purpose of watering it with the model irrigation pumping system in California.

at that time and when the Patterson Ranch Company was ready to extend their model plant they chose pumps of a later design as the best produced at that time but these were also "American" centrifugals.

There are now about 20,000 acres under water on this ranch, pumped by about 30 "American" centrifugals of 15 and 20-inch rated size, but the 15-inch pumps are equipped with 24-inch suction and 20-inch discharge, and the 20-inch



Interior and Exterior Views of One of the Five Pumping Stations on Lands of the Patterson Ranch Company, California, Equipped with "American" Centrifugal Pumps.

The plan called for five pumping stations constructed of concrete, five reservoirs lined with concrete and concrete lined canals of best construction.

There were about 7,000 acres watered by the original unit which was constructed in 1910. This was so successful that additional lands were acquired and the plant considerably more than doubled in size during 1912.

But the important point is that "American" centrifugals were purchased for the original unit as representing the most advanced practice in pump design

pumps are fitted with 30-inch suction and 24-inch discharge pipes.

The reason why "American" centrifugals have a reputation for quality is because the designs are constantly changing—they are built by pump designers and not mere pump manufacturers. Skillful centrifugal pump designers know things today about the performance of centrifugals they did not a year ago. Present "American" centrifugals embody present knowledge of centrifugal design.

"American" centrifugals "keep up."

Catalogs 117 and 124 tell about them.

The American Well Works

General Office and Works: Aurora, Ill.

Chicago Office: First National Bank Building

Just the
Plow for
Irrigated
Sections



Leaves
No
Dead
Furrows

The Sulky with the Steel Frame and the Patent Auto Foot-Shift

A Two-Way Sulky Plow with a steel frame—a big improvement in Two-Way plows. Strong, neat in appearance, all steel and malleable—no cumbersome cast iron parts—no surplus weight. Lightest draft Two-Way sulky ever built.

Notice the patent auto foot-shift pedals in the illustration below. They operate like the foot-shift on an automobile. Press the foot pedal; that's all you do to shift the pole. This regulates width of furrow, plowing around curves or holding plow to work on hillside.

The John Deere Two-Way Plow is always in balance, whether operated by man or boy.

John Deere Two-Way Plows are equipped with Quick Detachable shares—quick attachable, too. Saves eighty per-cent of the time required to change old style shares.

A plow of this type is generally thought of as a hillside plow, but the John Deere Two-Way Sulky is much more than that. It is used extensively on level land. Especially desirable in the irrigated sections, because it throws furrows one way, and leaves a level field. There are no dead furrows to fill or ridges to level. Requires about twenty-five per cent less labor to irrigate ground plowed with a Two-Way Plow. Also takes less water. Adapted to either a two or three horse hitch.

Some of the Good Things about the John Deere Two-Way Plow

1.—Steel Frame

Makes plow strong, light draft, neat in appearance and durable.

2.—Steel Arch

Special channel steel, one of the strongest shapes into which steel is rolled.

3.—All Steel and Malleable

Practically unbreakable. You can pound any part of it with a hammer.

4.—Direct Draft

Draft is always from beam point. Clevis shifts on rod from one plow to other, according to which is working.

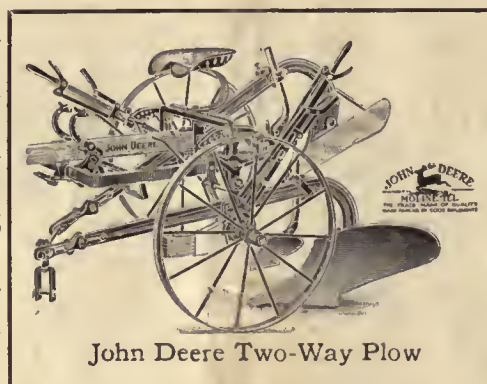
5.—Flat Steel Levers

Handy, easy to operate, positive, strong.

6.—Long Frame

Always in perfect balance, whether used by a man or boy.

7.—Removable Shin Pieces
on chilled bottoms.



John Deere Two-Way Plow

8.—Positive Pole Shift

Our patent auto foot shift operates easily. It is really a power shift when plow is in motion. Most perfect and convenient foot shift ever invented.

9.—Chilled, Steel, or Combination Chilled and Steel Bottoms

Can be fitted with bottoms for any soil and to work under all conditions.

10.—Wide Truck

Staunch on hillside work. Steady running.

11.—Foot Lift

Plow always under control of feet—hands free to control the team.

12.—No Dead Furrows—Level Field

Level fields are necessary to irrigate. This can be done with a Two-Way plow—it throws dirt all one way.

John Deere Plow Company, : Moline, Ill.

THE IRRIGATION AGE

CHICAGO, ILLINOIS

With Which Is Merged

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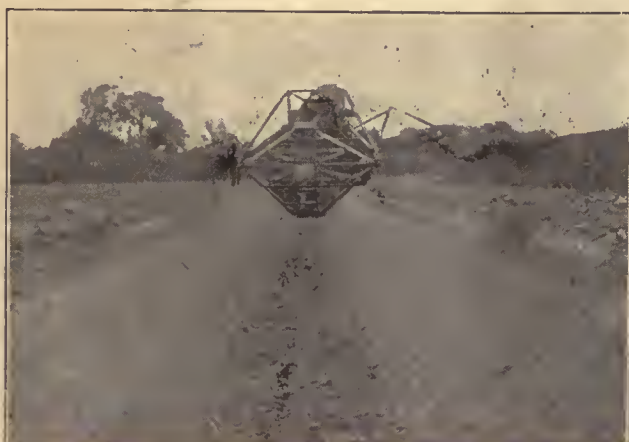
JUNE, 1913

Vol. XVIII

TITLE REGISTERED U.S. PATENT OFFICE

No. 8

Many Miles of Small Open Ditch Are Built to One Mile of Main Canal



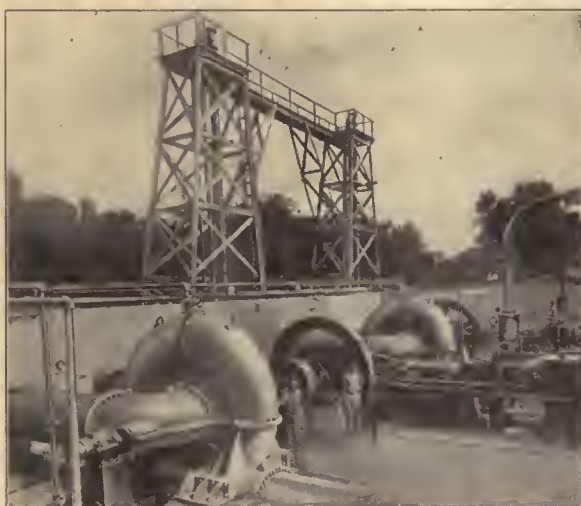
An Austin Trench Excavator with Bank Sloping Attachment

will equip a contractor to dig any size of tile ditch now used and practically all sizes of open ditches except large laterals to the main canal.

Let us tell you how to do profitable small ditch contracting by machine.

Send for Circular No. 200

F. C. AUSTIN DRAINAGE EXCAVATOR COMPANY Ry. Ex., Chicago, Ill.
Agents Wanted in Open Territory



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SPECIAL FEATURES

Alfalfa Inoculation
Tests.

The West in
Miniature.

A Settlers Experience in
Australia.

Mail by
Freight.

Myers Power Pumps

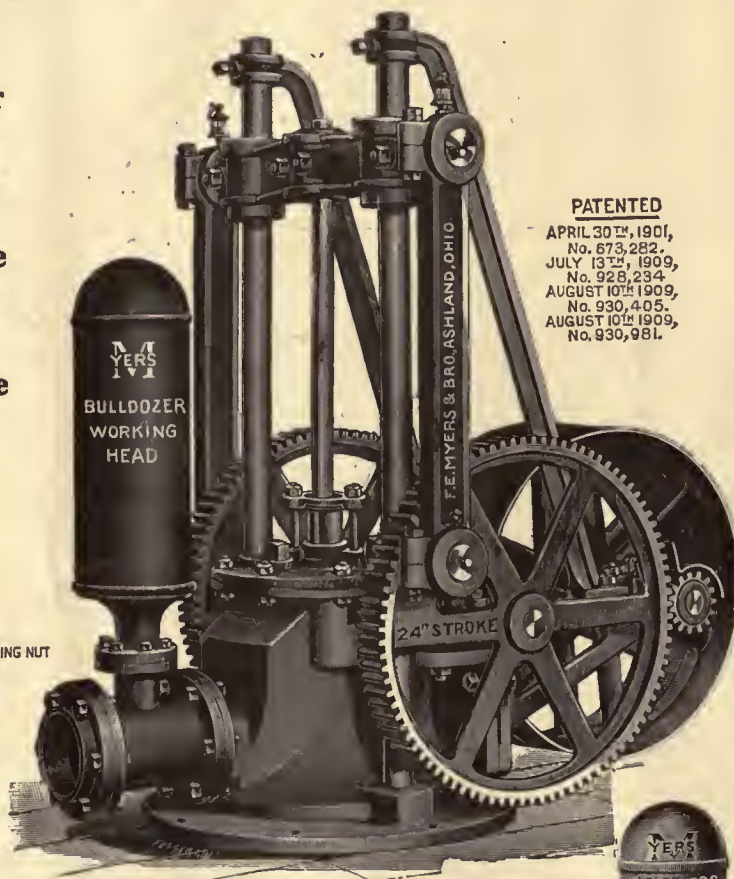
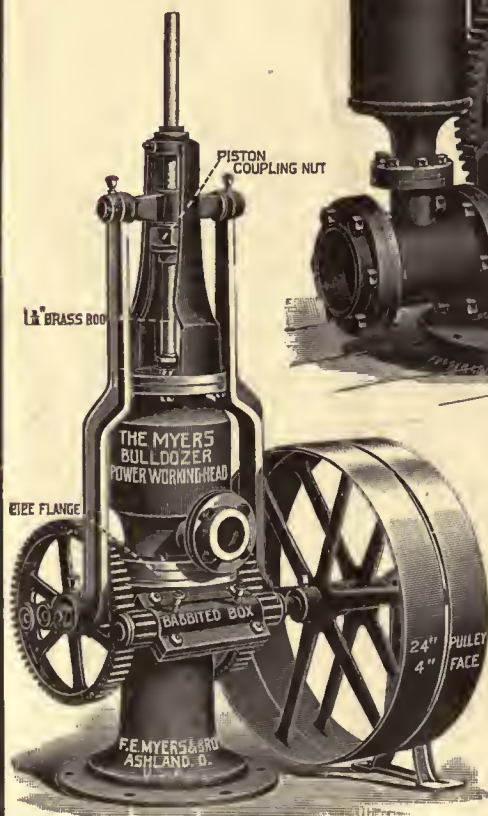
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No. 930,981.

PATENTED

The Myers
Bulldozer
Power Pumps
For
Shallow Wells

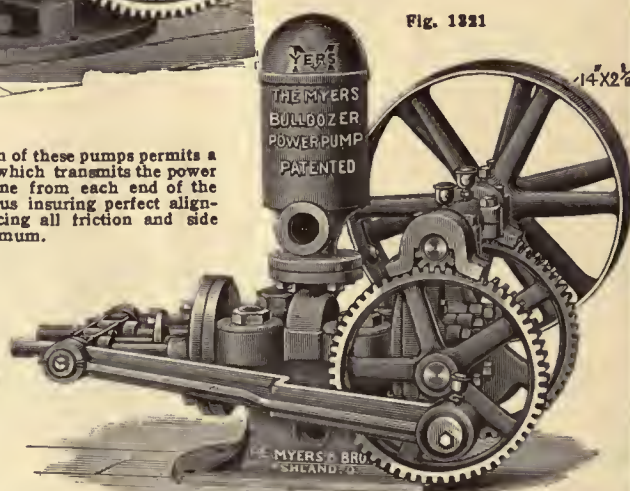
Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2½ to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

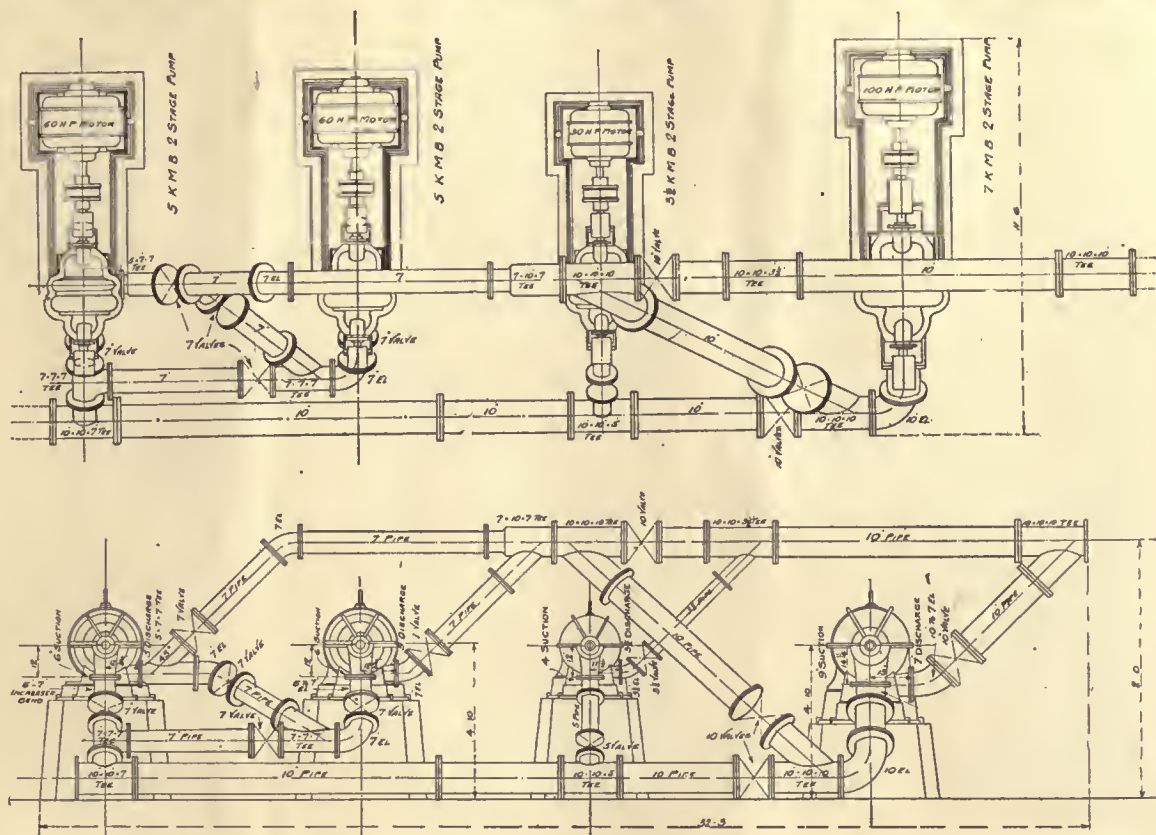
Fig. 1321



The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

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for
Catalogue
and
Prices

F. E. MYERS & BRO., ASHLAND, OHIO
ASHLAND PUMP AND HAY TOOL WORKS



The Flexibility of A Waterworks Installation of "American" Centrifugal Pumps

HERE is a typical design of a small waterworks pumping plant of "American" Centrifugals.

This plant consists of four small two-stage pumps so piped that any one, any two, any three, or the entire four pumps can be operated at the same time as two-stage pumps.

The plant is designed, however, to have the first two pumps serve domestic purposes. Each of these pumps has a capacity of 750 gallons per minute, or they have a combined capacity of 1500 gallons per minute when operating in parallel, or by manipulating the valves and throwing the pumps into series they form a four-stage pressure pump of 750 gallons per minute capacity.

The fourth pump has a capacity of 1500 gallons per minute and serves as a relay pump for the first two when operating in parallel to produce a four-stage pump of 1500 gallons per minute for fire service.

The third pump is designed to operate independently for night service.

This design can be used in a pumping plant of any capacity provided that the first two pumps have the same capacity and that the fourth pump has a capacity equal to the first two when operating in parallel.

In this installation the discharge is overhead so that pumps can be placed in a pit within easy suction distance of water supply and the discharge pipe lead directly into mains.

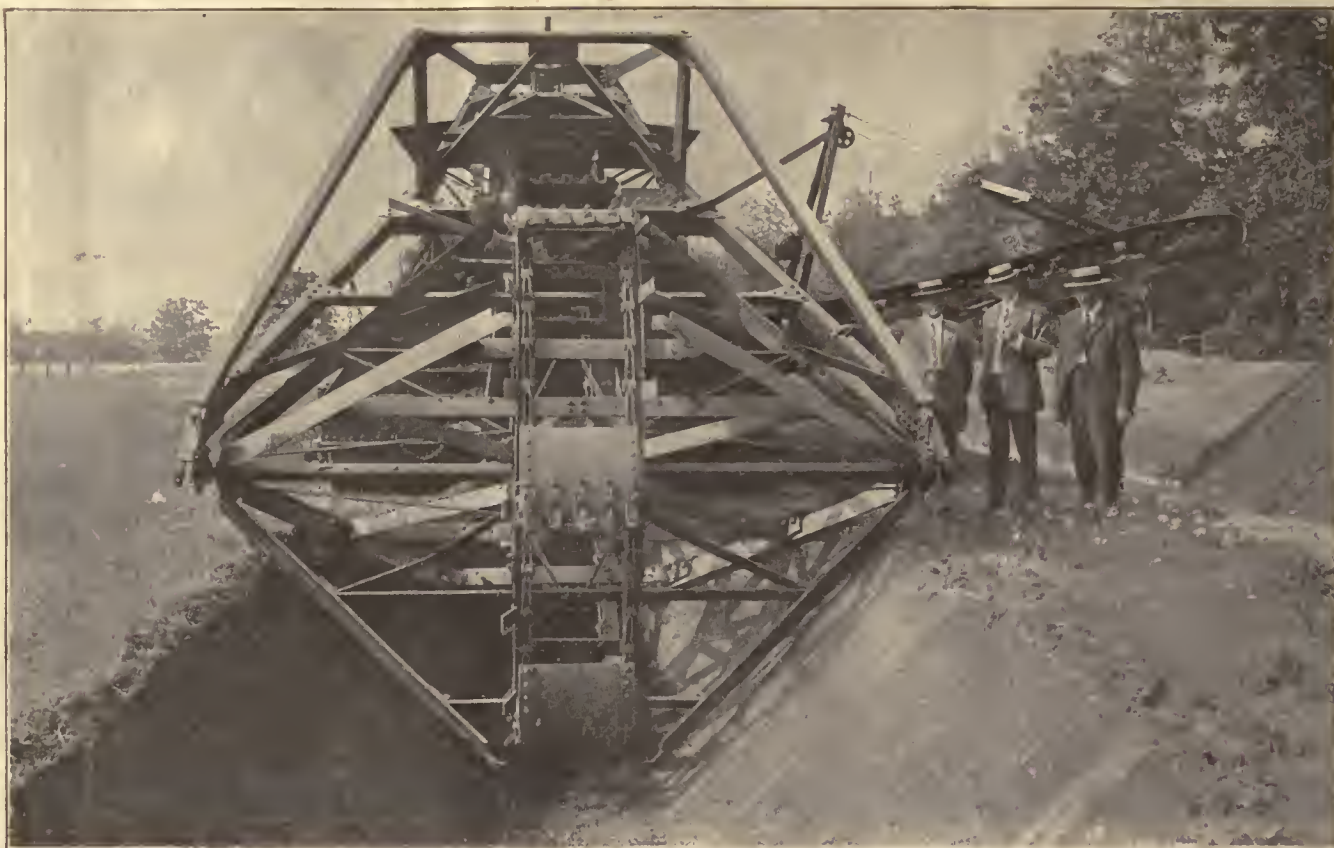
But the important feature is that it produces a plant of greatest flexibility of quantity of delivery and pressure-head so designed that pumps always operate under maximum efficiency and the plant would not be seriously crippled if any pump should become temporarily inoperative.

And it combines this flexibility with the high efficiencies and other economies of the "American" Centrifugal.

Bulletin 131 shows a large number of designs for waterworks installations. It ought to interest you.

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General Office and Works: Aurora, Ill.
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Any Size of Irrigation Ditch Can be Dug with Austin Ditchers

The Austin Ditch Machine with Bank-Sloping Attachment is an all-steel machine with working parts of special alloy steel. It digs, side slopes and cleans the ditch in one operation. It has positively self-cleaning buckets and cannot clog. It is mounted on caterpillar tractions which will not mire. It has dug three feet of frost and the hardest adobe soil. It travels by its own power $1\frac{1}{2}$ miles per hour. It digs in ordinary soil from six to nine feet of ditch per minute.

The Full Line of Austin Ditchers Comprises

Austin Wheel Machines which dig ditches to any bottom width from 18 ins. to 4 ft.

Austin Type R Machines which dig ditches to any bottom width from 4 ft. to 16 ft.

Austin Type A Machines which will dig ditches to any bottom width from 6 ft. to 20 ft.

Austin Levee Builders which will dig ditches to any bottom width from 20 ft. to 75 ft.

Special Austin Machines are built to dig side hill ditches, ditches with spoil bank graded to form highways, etc.

Send for Catalog No. 200

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Chicago, Ill.

THE IRRIGATION AGE

CHICAGO, ILLINOIS

With Which Is Merged
**National
Land and Irrigation
Journal**

JULY, 1913

Vol. XVIII

TITLE REGISTERED U.S. PATENT OFFICE

No. 9

SCIENTIFIC DITCHING

IS BUILDING A SHAPELY, DURABLE CHANNEL TO CARRY WATER



We Specialize in Ditching Machinery, Both for Open Ditches and Pipe Line Work.

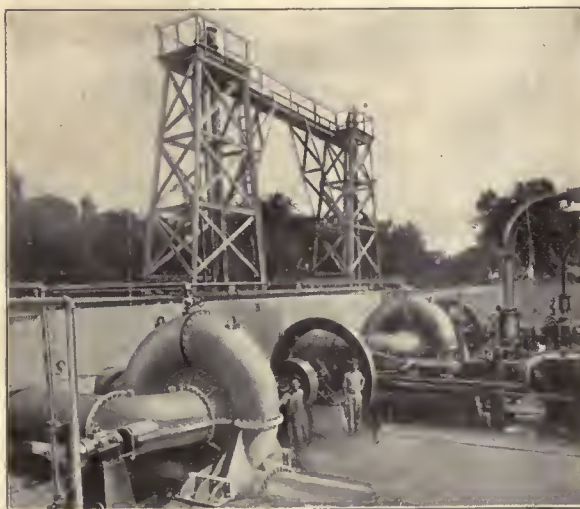
These various machines are known to contractors as the "AUSTIN LINE," comprising the following:

- Drainage Excavator—Type A
- Drainage Excavator—Type B
- Drainage Excavator—Type R
- Levee Builder
- Drag Line Excavator
- Special Wheel Ditcher
- Side Hill Ditcher
- Highway Ditcher
- Orange Peel Ditcher
- Pipe Line Excavator
- Farm Tile Ditcher

Austin Sewer and Waterworks Excavator
Austin Combination Sloping or Vertical Bank Excavator

Let us know what your work is and we will send you the proper catalogue and suggest an outfit for your needs.

F. C. AUSTIN DRAINAGE EXCAVATOR COMPANY Ry. Ex., Chicago, Ill.
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Plain Facts about Irrigation
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Colonizing in Victoria,
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Myers Power Pumps

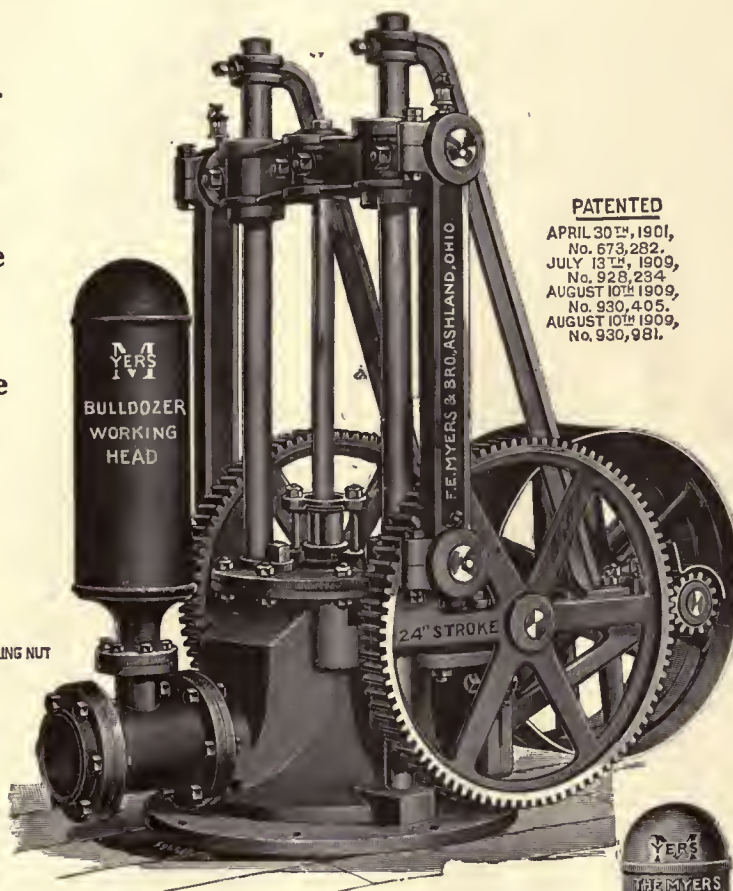
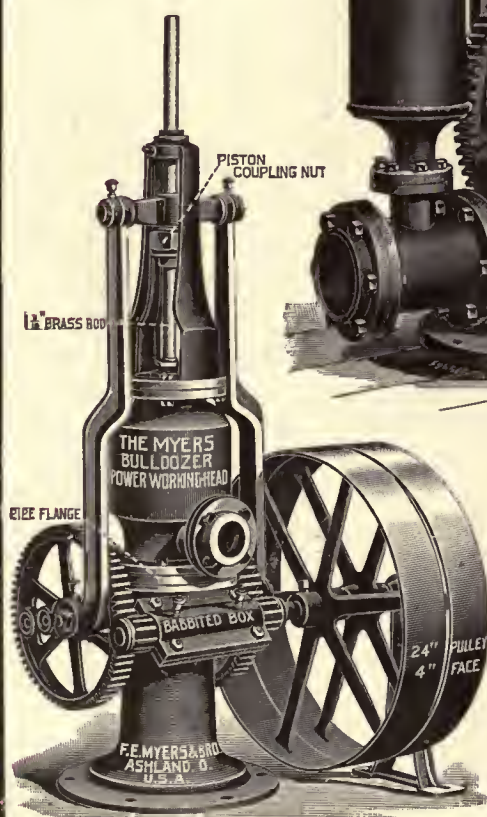
Working Heads, Pumping Jacks, Cylinders, Etc.

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The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches



PATENTED
APRIL 30TH, 1901,
No. 673,282.
JULY 13TH, 1909,
No. 928,234.
AUGUST 10TH 1909,
No. 930,405.
AUGUST 10TH 1909,
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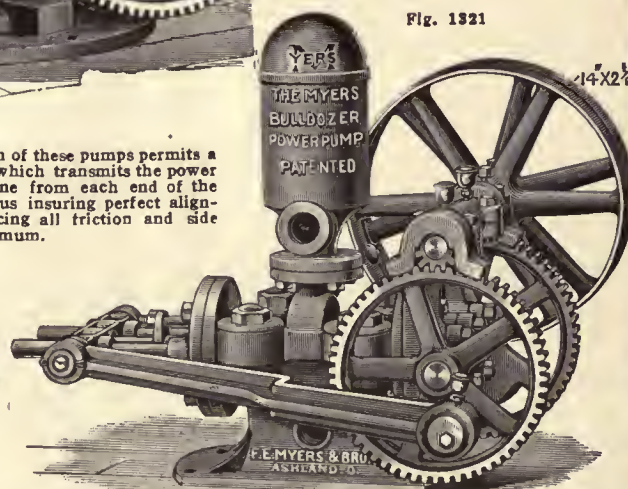
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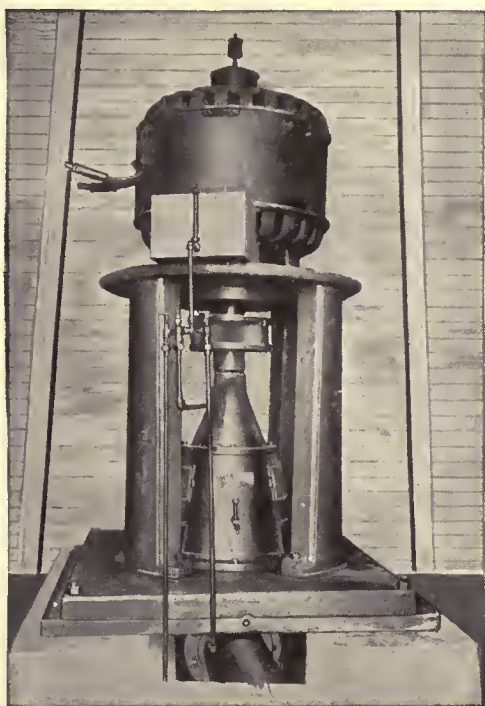
Fig. 1321



The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

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ASHLAND PUMP AND HAY TOOL WORKS



Interior View of One of the Pump Houses Showing American Turbine Centrifugal Pump.

some by American Deep Well Turbine Centrifugals. Four wells deliver 500 gallons per minute and one 400 gallons per minute. Average pumping depth is 73 feet and 500 gallon pumps are operated by 20 horse power motors.

But the important point is the main shafts and impellers are supported by roller thrust bearings at the surface, all oiling is done at the surface, there is nothing in the well that can get out of order and a permanent water supply is provided of greatest reliability, with least attendance, smallest expense for upkeep and the assurance that the water is pure.

"American" Centrifugals are made in types to meet nearly every pumping condition. Complete catalogs for the asking.

Difficult Water Supply Conditions Are Met with American Centrifugals

The highest development of the centrifugal principle of pumping and the application of this improved design to all styles of centrifugals enables the "American" centrifugal to successfully meet the most difficult water supply conditions,

At Tulsa, Oklahoma, the city water is obtained from wells which will not deliver a large quantity of water. The situation is successfully met by "American" centrifugals as shown in the accompanying views.

There are five wells located a considerable distance apart, two of which and the substation are illustrated. Some of the wells are pumped by American vertical centrifugals and



One of the wells illustrating the Housing and Discharge of Pump Before Pipe Connection Was Made.



Substation and Two of the Five Wells that Furnish the Water Supply for Tulsa, Okla.

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An Austin Drainage Excavator Ditch Costs Less to Dig Carries More Water CAN BE LINED



A Ditch with sides sloped to exact angles is dug in one operation.

The Bucket is double acting, taking a cut both right and left, is self-cleaning and will dump at any point in both banks of the ditch.

Multipedal Traction carries the machine and absolutely prevents miring in any ground over which a horse can be driven.

The Templet Frame is raised and lowered by cables so as to absolutely prevent binding.

All Machinery is above reach by weeds or sand and is housed.

The Machine Travels by its own power along the work and from ditch to ditch.

Irrigation Canals can be Lined

Directly on the sides of the cut made by the machine and cost of trimming required with any other method of machine excavation is eliminated.

***Austin Drainage Excavators Rank with Steam Shovels
in Yardage Handled Per Day—800 to 1000 Cubic Yards***

Catalog "S" Describes Our Complete Line of Ditching Machinery

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AUGUST, 1913

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Austin Sewer and Waterworks Excavator
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Sanitary Floors for Sheep,
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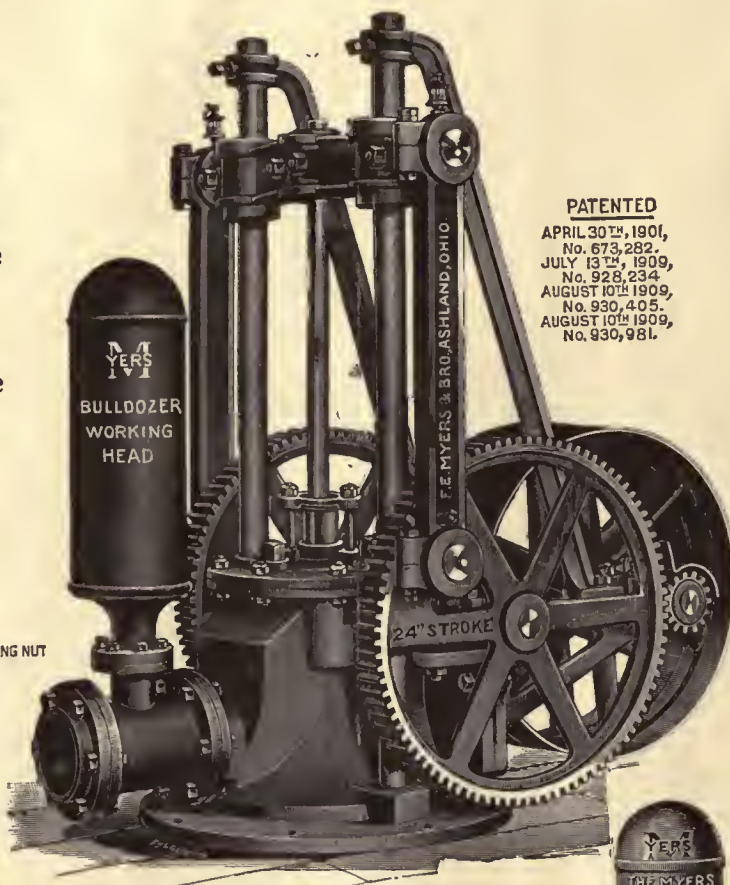
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For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches



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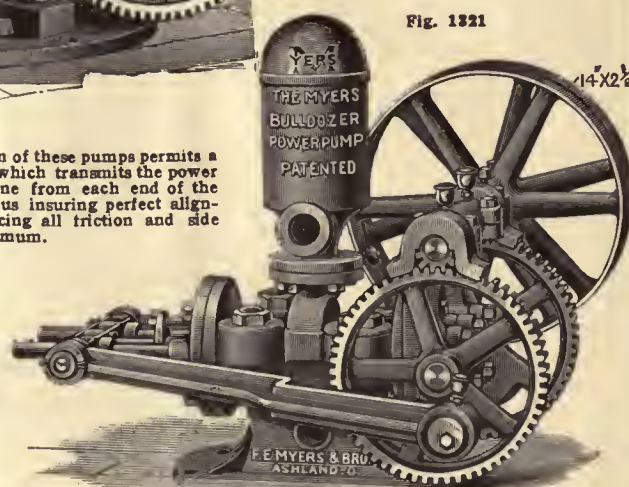
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Discharge
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600 to 7200 Gallons
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Fig. 1321



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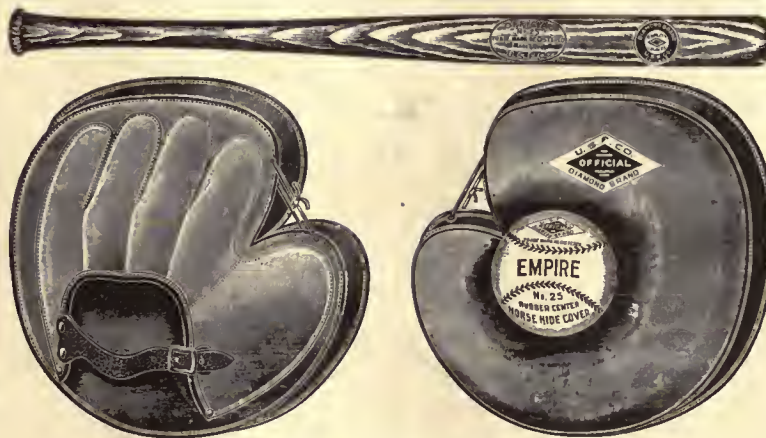
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Any Boy Can Get This League **BAT, BALL AND MITT**

Absolutely **FREE**

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BOY



TO GET
This
DANDY
OUTFIT
IN YOUR
TOWN

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Should you only succeed in securing 2 subscriptions we will send you the Ball.

The Bat

If you get only 3 subscriptions we will send you the Bat, or,

The Mitt

If you should only get 4 subscriptions the Mitt and Ball will be forwarded to you.

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Contains More Practical Information On Irrigation Pumping Than Any Other Published

It is not a catalog but a booklet on the most economical types of pumping installations to meet different irrigation pumping conditions.

The American Well Works install more pumps for irrigation purposes than any other American manufacturer. Recognizing that the best type of pump for the location is rarely installed this booklet was prepared to illustrate and describe different pumping conditions and the types of pumps adapted to handle them most successfully. "American" pumps are illustrated only to show types of installations.

Besides pumping installation, the leading methods of applying water in irrigation are illustrated and briefly described. The booklet also contains several pages of valuable irrigation pumping tables.

This booklet is $7\frac{1}{2} \times 10\frac{1}{2}$ inches in size, contains 72 pages and cover, is illustrated by 76 half tone engravings and line drawings and contains more practical information on irrigation pumping than any other book published. A copy will be sent to you free provided you mention this paper and Bulletin 127.

If interested in "American" pumping-machinery ask for Catalog 110 describing deep well plunger pumps; Catalog 117 describing centrifugal pumps; Catalog 124 describing deep well centrifugals.

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CHICAGO, ILLINOIS

With Which Is Merged
**National
Land and Irrigation
Journal**

SEPTEMBER, 1913

Vol. XVIII

TITLE REGISTERED U.S. PATENT OFFICE

No. 11

Maintaining Ditches is a Big Problem of Irrigation and Land Reclamation

Take a ditch dug by the Austin Drainage Excavator. Hard, smooth, firm slopes of absolute uniformity. A good berm with properly placed banks.



No chance of eaving banks or accumulations of debris.

Or take a dipper dredge product. Banks gouged out to irregular line and left in prime condition to eave; bottom irregular, so capacity is reduced and accumulation of silt and debris made certain.

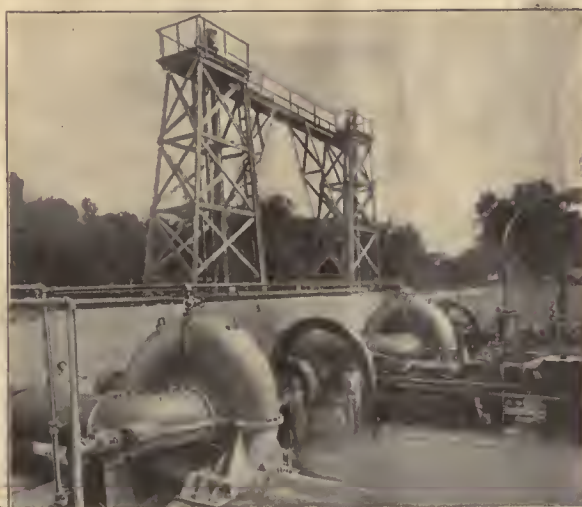
Your interests make it worth while to know the proper method of constructing ditches.

Catalog "S" will give you many reliable ideas of what others have done in this direction.

F. C. Austin Drainage Excavator Company

Agents wanted in open territory

Railway Exchange Chicago, Ill.



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Drinking Water

Myers Power Pumps

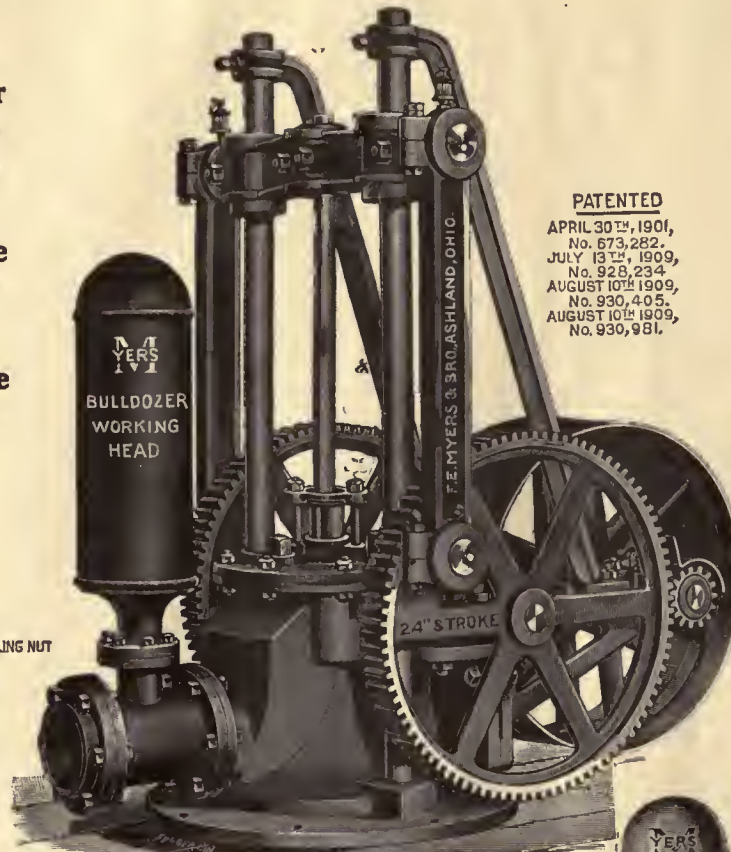
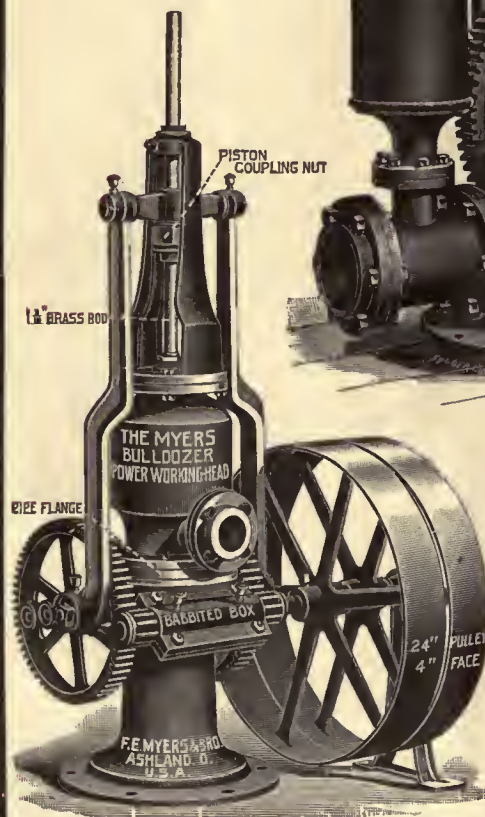
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PATENTED

**The Myers
Bulldozer Power
Working Heads
For Deep Wells**

**Length of Stroke
5 to 24 inches**

**Size of Discharge
Up to 6 inches**



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Fig. 1321

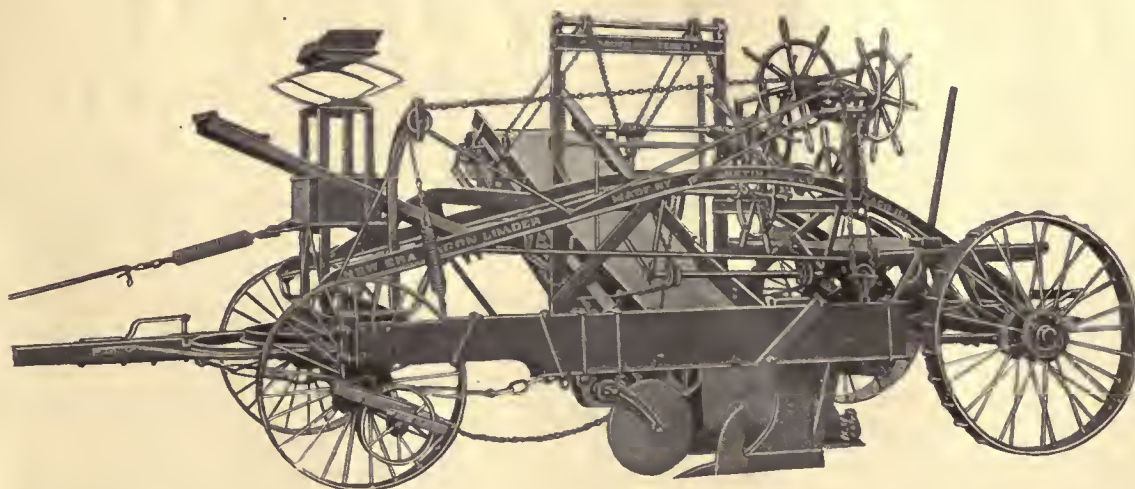


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All that an international Motor Truck asks for is a shed, and a small ration of gasoline and oil—that's all. And when it's not working it wants only the shed. For profit and economy buy an

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You will find that it costs considerably less than horse and wagon keep, it goes four times as fast and as far as the horse, saves you many hours of time, and will run twenty-four hours in a day if necessary. In reliability, strength, and ease of management, it is best.

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OCTOBER, 1913

Vol. XVIII

TITLE REGISTERED U.S. PATENT OFFICE

No. 12

An Austin Drainage Excavator



gives you an "edge" over every competitor when the bidding is close. The saving it affords over mule-and-scraper ditching in concrete lined work will amount to over 10%, according to government reports. Bid 5% less than the man without an Austin—and make 5% more than he could at his bid.

**Does such a proposition
interest you?**

For details on fast, economical digging of perfect ditches
Write for Catalog "S"

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Settlers Complain

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Per Acre

Myers Power Pumps

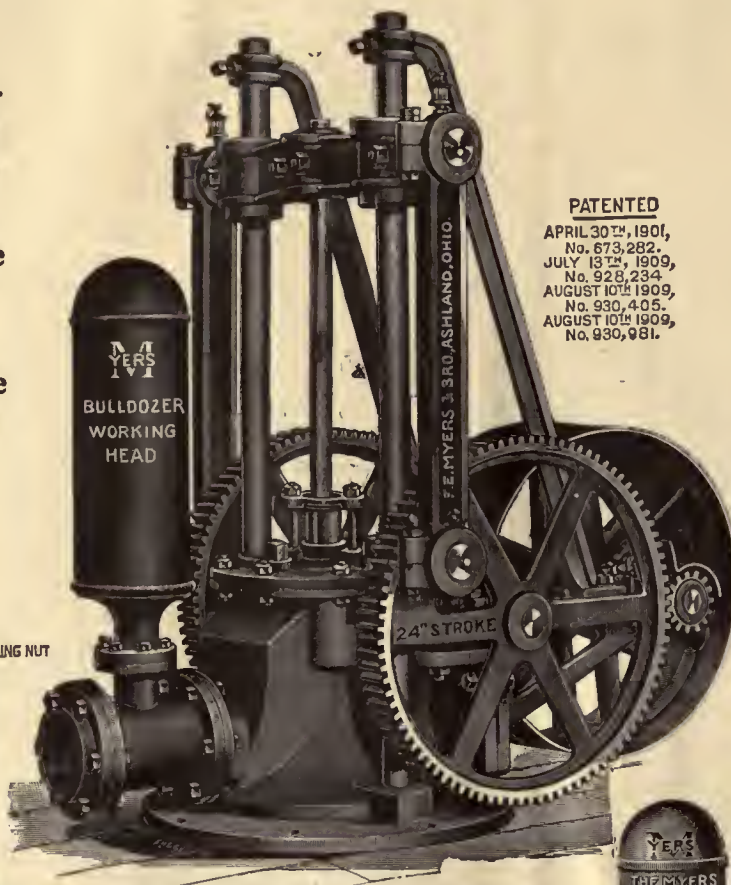
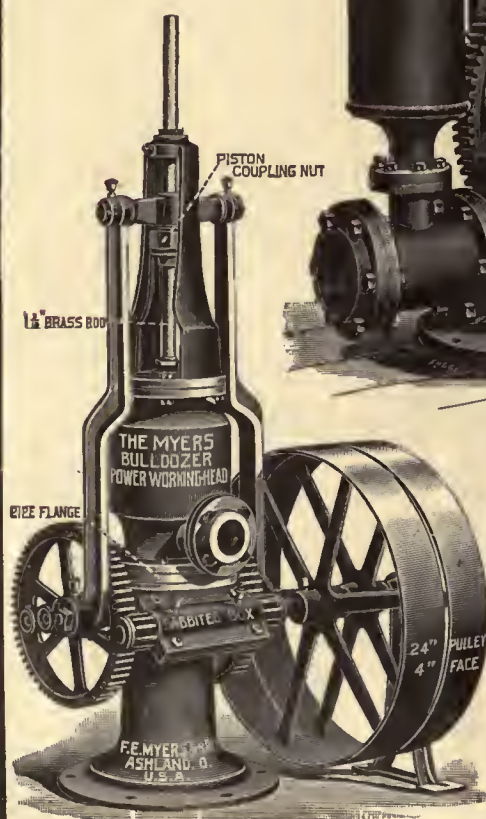
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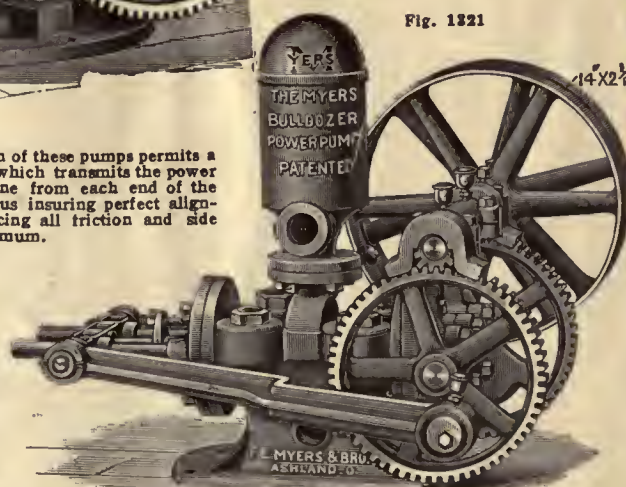
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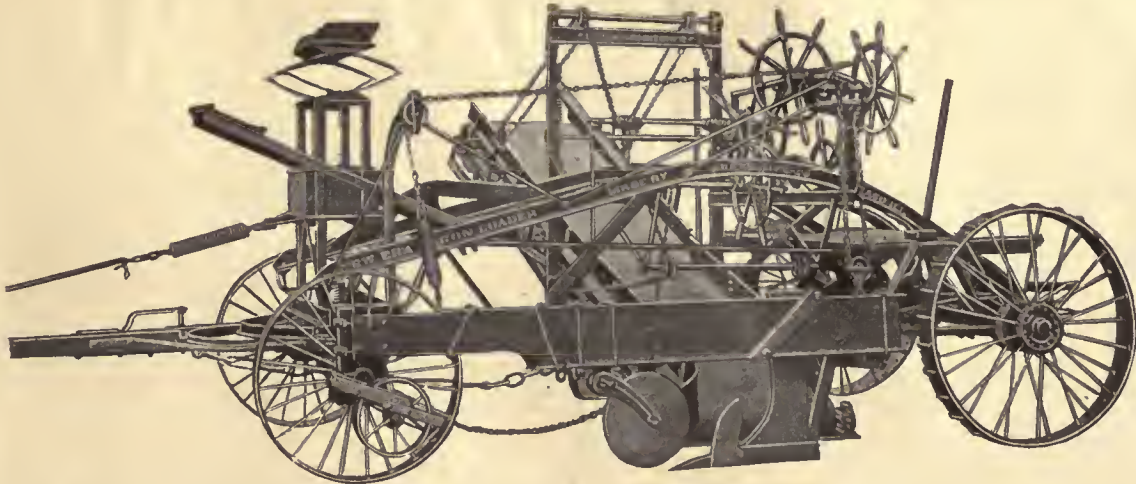


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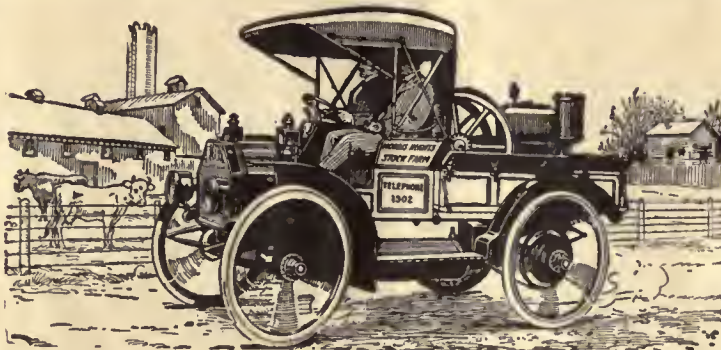
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